

For an Equitable Textbook: Universal Design for Learning is a Must

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Check In:

Use a 1 - 10 scale to answer these (10 is very or high)

1. How present are you for this experience right now?
2. Where do you locate your skill set in terms of textbook design for equity and accessibility?
3. How comfortable are you in talking with your publisher about textbook design?

Based on the above numbers please think about would you need to move one or two of these numbers up as we go through this workshop.

Outline for Today's Session

- Discuss need for design and format of textbook that creates accessible pedagogy and learning
- Review principles of Universal Design for Learning (UDL)
- Identify strategies to apply UDL to our own textbooks

Have you heard of or do you implement UDL in your teaching/ textbook materials or teaching?

Please put in ONE Chat:

- **Yes or No to have heard of UDL**
- **If Yes are you using it in your teaching and/or textbook/writing?**

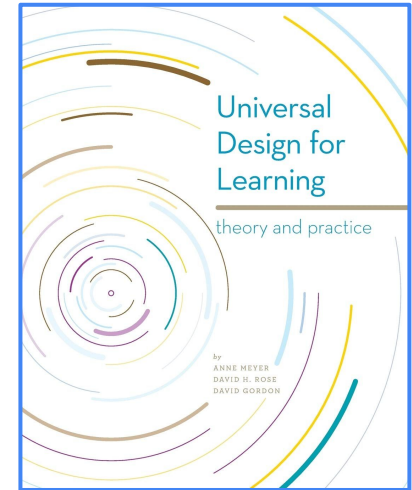
Learning materials should be usable by all people without the need for adaptation

Goal is to create learning materials that are:

- Accessible
- Inclusive
- Represent diversity and equity
- Develop mastery in learners

History:

- Universal Design (UD) referred to design of products and environments (Ronald Mace, architect, 1960's)
- Universal Design for Learning (UDL) - based on research on cognitive neurosciences of learning (for review see Fornauf, B.S. and Erickson, J.D., 2020)



Meyer, A., Rose, D.H. and Gordon, D., 2014.
Universal design for learning: Theory and
practice. (CAST).

Universal Design for Learning Guidelines

from Center for Applied Special Technology (CAST)

The Universal Design for Learning Guidelines

Provide multiple means of
Engagement

Affective Networks
The "WHY" of Learning



Provide multiple means of
Representation

Recognition Networks
The "WHAT" of Learning



CAST | Until learning has no limits™

Provide multiple means of
Action & Expression

Strategic Networks
The "HOW" of Learning



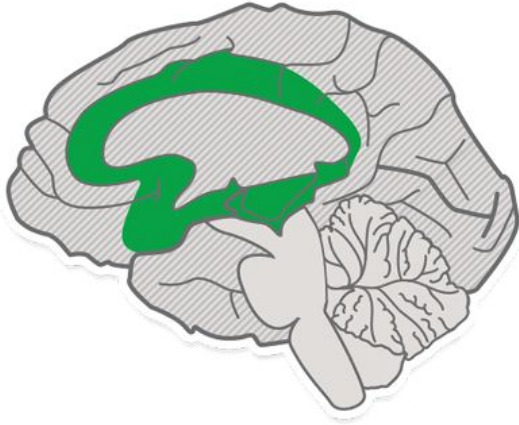
**Does it have meaning?
(relevance)**

**Does it make sense?
(context)**

**How does the learning
happen?
(implementation techniques)**

Engagement (WHY)

AFFECTIVE NETWORKS:
THE **WHY** OF LEARNING



Provide options for:

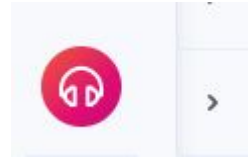
Recruiting interest

Sustaining effort & persistence

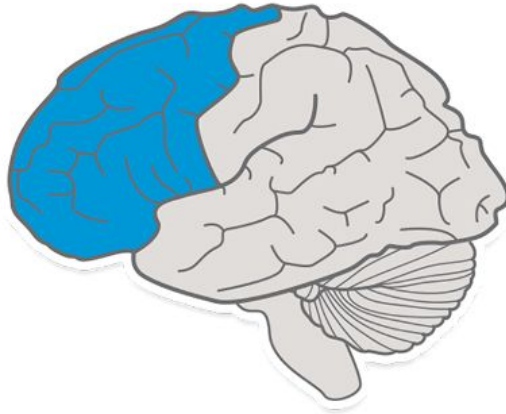
Self regulation

**Goal: Learners who are
purposeful & motivated**

Action and Expression (HOW)



STRATEGIC NETWORKS:
THE **HOW** OF LEARNING



Provide options for:

Physical action

Expression & communication

Executive functions

**Goal: Learners who are
strategic & goal-directed**

Representation

RECOGNITION NETWORKS:
THE **WHAT** OF LEARNING



**Goal: Learners who are
resourceful & knowledgeable**

Provide options for:

Perception:

- Customizing display of information
- Offering multiple ways of displaying information (auditory & visual)

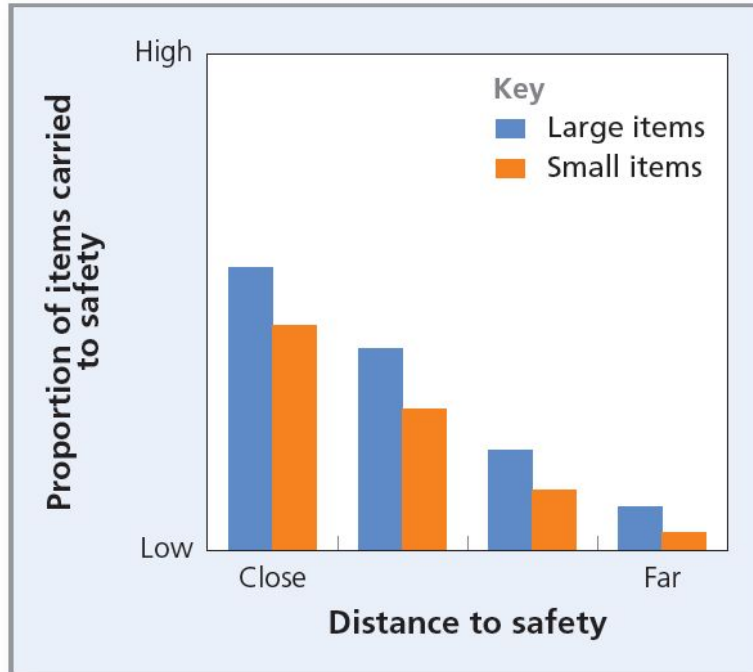
Language & Symbols:

Comprehension:

-

Perception: Creating accessible figures

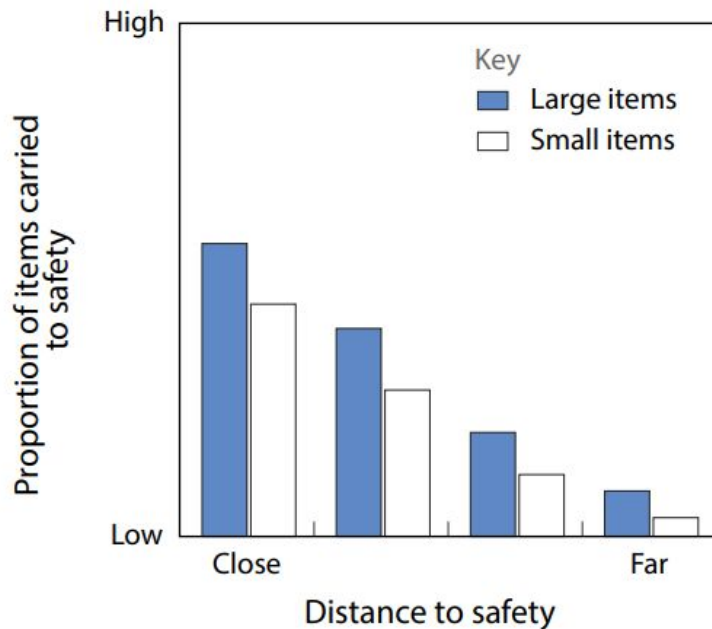
Size, contrast, color



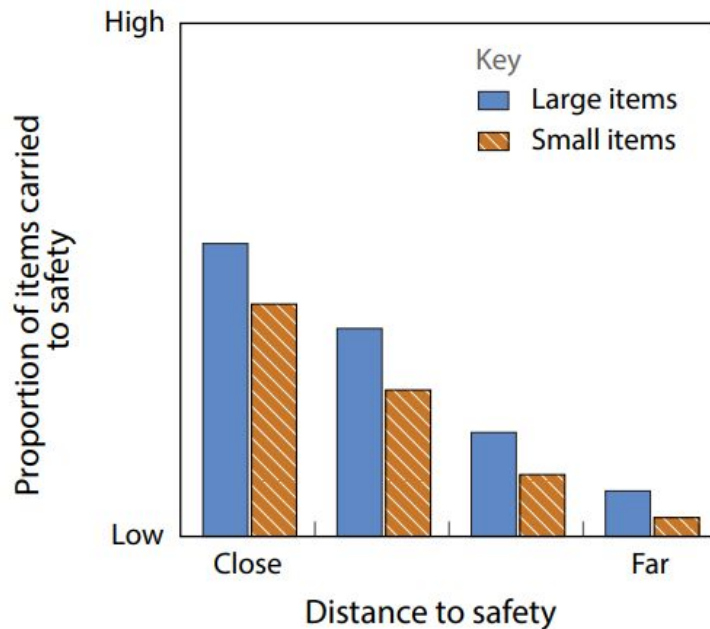
PERCEPTION - Web Content Accessibility Guidelines (WCAG)

Contrast and Color Accessibility

Previous 1.11



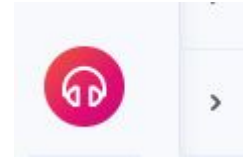
Modified 1.11



Perception - Multiple Ways of Displaying: Audio

Many eBooks have
audio feature in
platform or can be
converted

Speechify.com
Vitalsource.com



 **Speechify**



Read Aloud

Listen and follow along as
Bookshelf reads to you.

Representation

RECOGNITION NETWORKS:
THE **WHAT** OF LEARNING



**Goal: Learners who are
resourceful & knowledgeable**

Provide options for:

Perception:

- Customizing display of information
- Offering multiple ways of displaying information (auditory & visual)

Language & Symbols:

- Clarify vocabulary (key terms location)
- Support decoding of text, mathematical notation, and symbols

Comprehension:

Language & Symbols: Print textbooks

Location of key word definitions near text

Conspecific attraction

The IFD model assumes that competition for resources results in a decline in individual fitness as the number of individuals in a habitat increases. Because each additional individual reduces fitness for all, owing to competition, new settlers should avoid rivals if a better option exists. Sometimes, however, individuals exhibit the opposite pattern. Instead of avoiding others, they settle near them, a pattern known as **conspecific attraction**.

Why might individuals exhibit conspecific attraction? Two hypotheses exist. First, for very low population sizes, fitness may increase as more individuals settle, a phenomenon known as an **Allee effect** (Allee 1931). For example, a solitary individual might be at high risk of predation, whereas two or more individuals might experience lower risk. Similarly, a group might be more attractive to potential mates than a single individual.

Second, it may be difficult for individuals to assess the relative quality of some habitats—an ability assumed by the IFD model. Habitat quality is a function of many factors, such as resource levels, the availability of nesting locations, and the

■ conspecific attraction

A phenomenon in which individuals are attracted to others, particularly during habitat selection.

- **Allee effect** A situation in which the fitness of individuals increases with increased population density.

Language & Symbols: eBooks

Key terms pop up with definition

Density

Regardless of its mass or volume, most types of wood will float on water while a piece of metal will sink. This observation implies that the mass of wood that fits into a certain space is less than that for metal. This property of matter is called density. **Density**[Ⓟ] (d) is a comparison (also called a ratio) of a substance's mass (m) to its volume (V). This c

$$d = \frac{m}{V}$$

Density

The comparison of a substance's mass to its volume.

Popup definition in front of text

One gram of water has a volume of one milliliter, so the density of water is 1.00 g/mL. A piece of wood will float on water because it is less dense than water, while a piece of metal will sink because it is more dense than water (see **Figure 1.5**[□]).

Figure 1.5 Visualizing density.



General, Organic, and Biological Chemistry, 4/e

Laura D. Frost

Language & Symbols: eBooks

Key terms pop up with definition with color border

5.2 Chemosensory systems detect chemicals that are perceived as tastes and odors

Learning Objectives

After reading this section, you should be able to

- distinguish between pheromones and odorants,
- differentiate between gustation and olfaction, and
- explain how researchers use behavior to assess the chemosensory capabilities of animals.

chemoreception

The process by which an animal detects chemical stimuli.

The most primitive and universal sensory system is **chemoreception**, the detection of chemical stimuli. Even single-celled organisms such as bacteria can detect and respond to these stimuli (e.g., [MacNab & Koshland 1972](#)). In multicellular organisms, chemoreception includes **gustation** (taste), the detection of dissolved chemicals known as tastants, and **olfaction** (sense of smell), the detection of water- or airborne

Popup definition in front of text

9.2 The Nature and Extent of Global Stratification

Learning Objectives

1. Explain why the terms First World, Second World, and Third World have fallen out of use.
2. Describe the most important characteristics of wealthy nations, middle-income nations, and poor nations.
3. Explain why it is important to measure global poverty.
4. Describe which world regions have higher or lower inequality and why.

Stratification within the United States was discussed in [Chapter 8 “Social Stratification”](#). As we saw then, there is a vast difference between the richest and poorest segments of American society. Stratification also exists across the world. [Global stratification](#) ▼

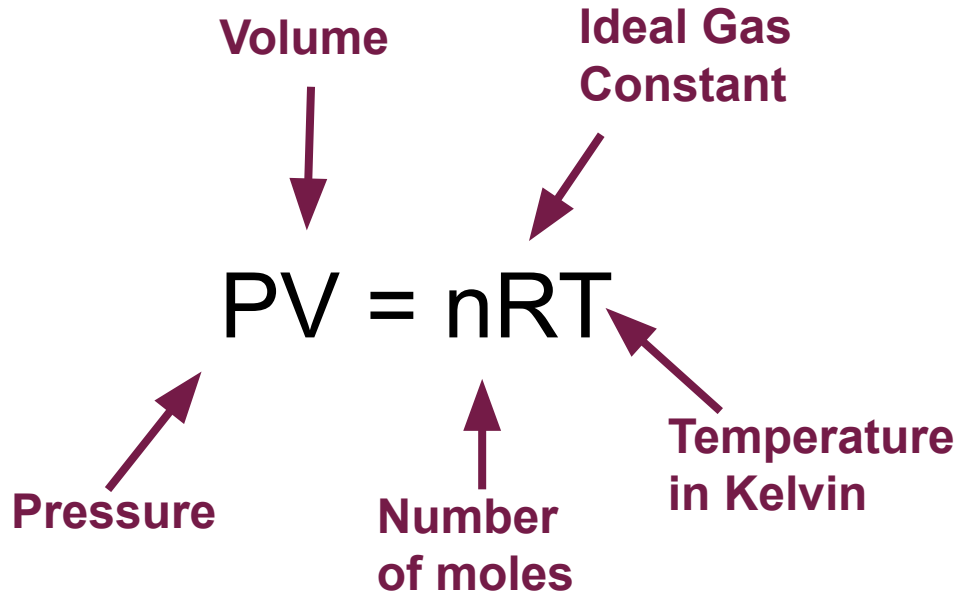
The unequal distribution of wealth, power, prestige, resources, and influence among the world's nations.

refers to the unequal distribution of wealth, power, prestige, resources, and influence among the world's nations. Put more simply, there is an extreme difference between the richest and poorest nations. A few nations, such as the United States, are very, very wealthy, while many more nations are very, very poor. Reflecting this latter fact, some 1.5 billion people worldwide live in extreme poverty, defined as having an annual income under \$1.90 per person per day (equal to \$2,774 annually for a family of four). About 8% of the world's population, or some 630 million people, live in such dire circumstances. As high as these numbers sound, they were much worse three decades ago, when 36% of the world's population, or 2 billion people, lived in extreme poverty (The Economist 2020).^[1]

Language &
Symbols: eBooks
Key terms pop up
with definition in line
with text

Popup definition
below text

Language & Symbols: eBooks
and defining Symbols - Has anyone seen
anything like this?



The Ideal Gas Law

Language & Symbols: Illustrate through multiple media

Sometimes the print version works better?

States of Matter

Did you know that every snowflake (made from frozen water) is unique, yet every snowflake has a six-sided structure? What is it about water, H_2O , that causes it to freeze into a structure with six sides? The behavior and composition of matter are defined for every substance at the submicroscopic level, in its particles. In the case of water, the H_2O particles are molecules in which the elements oxygen and hydrogen are chemically bonded together (we will discuss molecules in greater detail in Chapter 3). When water molecules freeze (as snowflakes or ice), they organize into a hexagonal structure giving a single snowflake its six-sided structure. This structure allows optimal contact between the water molecules. The properties of individual molecules are responsible for the properties that we can actually measure in substances.

Ice, liquid water, and steam (water vapor) represent different forms of matter. As long as it is kept frozen, ice has a definite, unchanging shape and volume, while liquid water has a definite volume, even as its shape changes depending on its container. It is hard to see steam, but we can witness the changes that it causes. When a kettle whistles, the water vapor building up inside escapes into the room, filling up the new, larger space it is given. Each of these examples represents a different state of matter. A **state of matter** is the physical form in which the matter exists. The three most common states of matter are solid, liquid, and gas, which for water would be ice, liquid water, and water vapor, respectively.

Print version

States of Matter

Did you know that every snowflake (made from frozen water) is unique, yet every snowflake has a six-sided structure? What is it about water, H_2O , that causes it to freeze into a structure with six sides? The behavior and composition of matter are defined for every substance at the submicroscopic level, in its particles. In the case of water, the H_2O particles are molecules in which the elements oxygen and hydrogen are chemically bonded together (we will discuss molecules in greater detail in [Chapter 3](#)). When water molecules freeze (as snowflakes or ice), they organize into a hexagonal structure giving a single snowflake its six-sided structure. This structure allows optimal contact between the water molecules. The properties of individual molecules are responsible for the properties that we can actually measure in substances.



A snowflake has a six-sided (hexagonal) structure because of the way molecules of water arrange themselves in the solid state.

eBook

Language & Symbols:




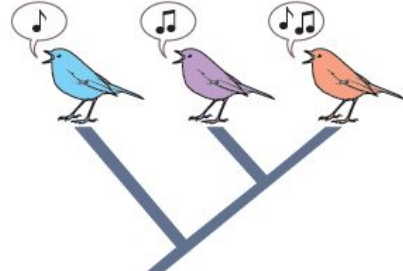
Present key concepts in symbolic representation

Tinbergen's four questions

The Dutch biologist and ornithologist Niko Tinbergen (1963) articulated four basic questions that can be asked about animal behavior:

1. What is the mechanism that causes the behavior?
2. How does the behavior develop?
3. What is the adaptive value (function) of the behavior?
4. How did the behavior evolve?

TABLE 1.2 Tinbergen's four questions. Proximate and ultimate questions and answers regarding birdsong. (Source: Adapted from Nesse [2013] and Kokko [2017])

	Focus on Current State	Focus on History
Proximate Explanations	<p>Q1: What mechanism causes the behavior to occur?</p> <p>A1: Changes in seasonality trigger hormonal responses that initiate song production.</p> 	<p>Q2: How does the behavior develop in the individual?</p> <p>A2: Young birds often learn song from adults.</p> 
Ultimate Explanations	<p>Q3: How does the behavior affect survival and reproduction?</p> <p>A3: Birdsong can function to attract mates.</p> 	<p>Q4: How did the behavior evolve?</p> <p>A4: Birdsong variation depends upon evolutionary history.</p> 

Representation

RECOGNITION NETWORKS:
THE **WHAT** OF LEARNING



**Goal: Learners who are
resourceful & knowledgeable**

Provide options for:

Perception:

- Customizing display of information
- Offering multiple ways of displaying information (auditory & visual)

Language & Symbols:

- Clarify vocabulary (key terms location)
- Illustrate through multiple media

Comprehension:

- **Activate or supply background knowledge**
- **Highlight patterns, big ideas, & relationships**
- **Guide information processing & visualization**
- **Maximize transfer & generalization**

Comprehension: eBooks: Activate prior knowledge

Spiraling (iterative processing) back to earlier information is easier

To fully answer this, we must consider two topics discussed in previous chapters: solubility, and diffusion across the cell membrane. In **Section 7.4**, when we discussed solubility of pharmaceuticals, we noted that if molecules contain charges, then they are more readily soluble in aqueous solution. This is advantageous for drugs that are administered orally. However, if substances are to move into the bloodstream or to be excreted to the urine, they will also have to diffuse across the cell membrane, a hydrophobic barrier (see **Section 8.6**). A neutral, uncharged form can more easily diffuse across the cell membrane.

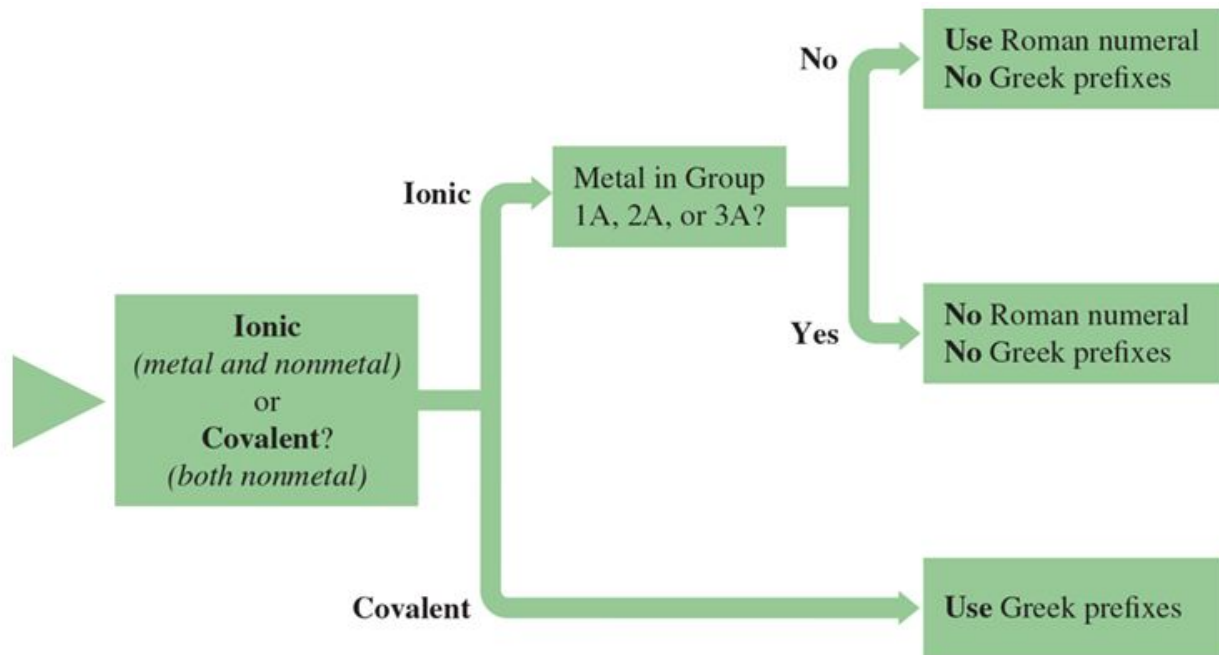


**General, Organic, and Biological
Chemistry, 4/e**

Laura D. Frost

Comprehension: Highlight patterns, big ideas, & relationships

Guide information processing & visualization

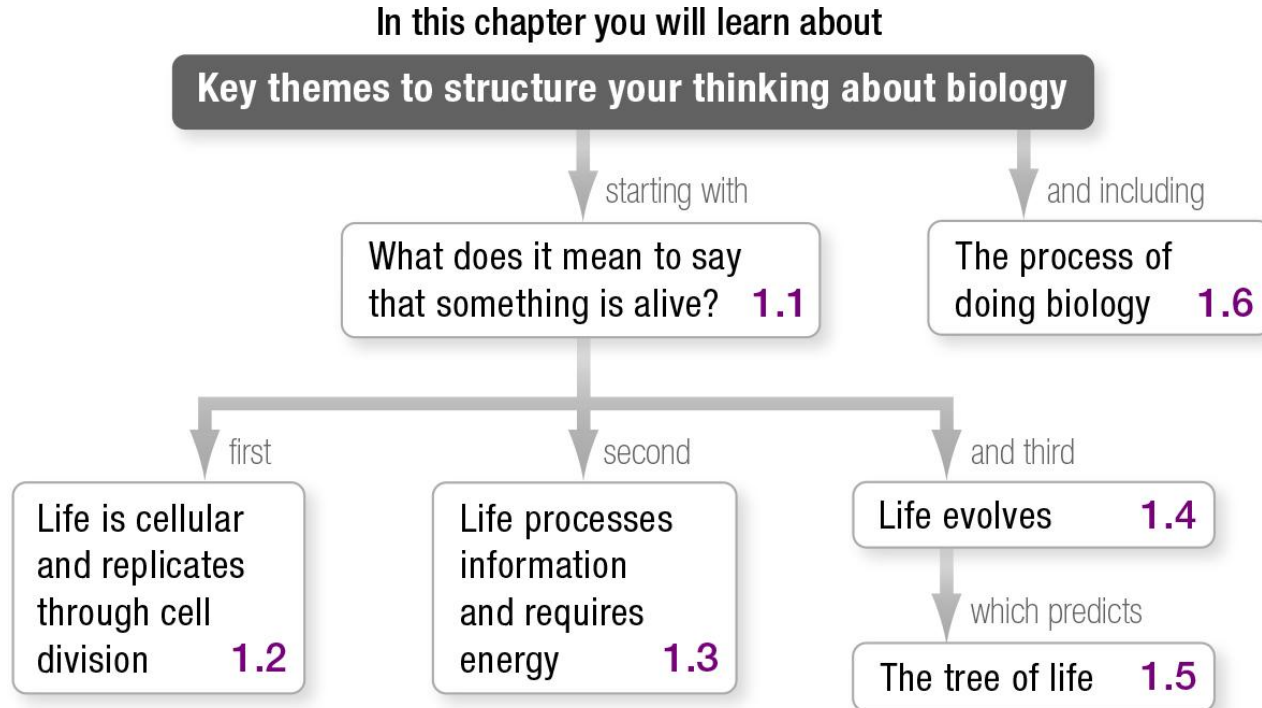


**General, Organic, and Biological
Chemistry, 4/e**

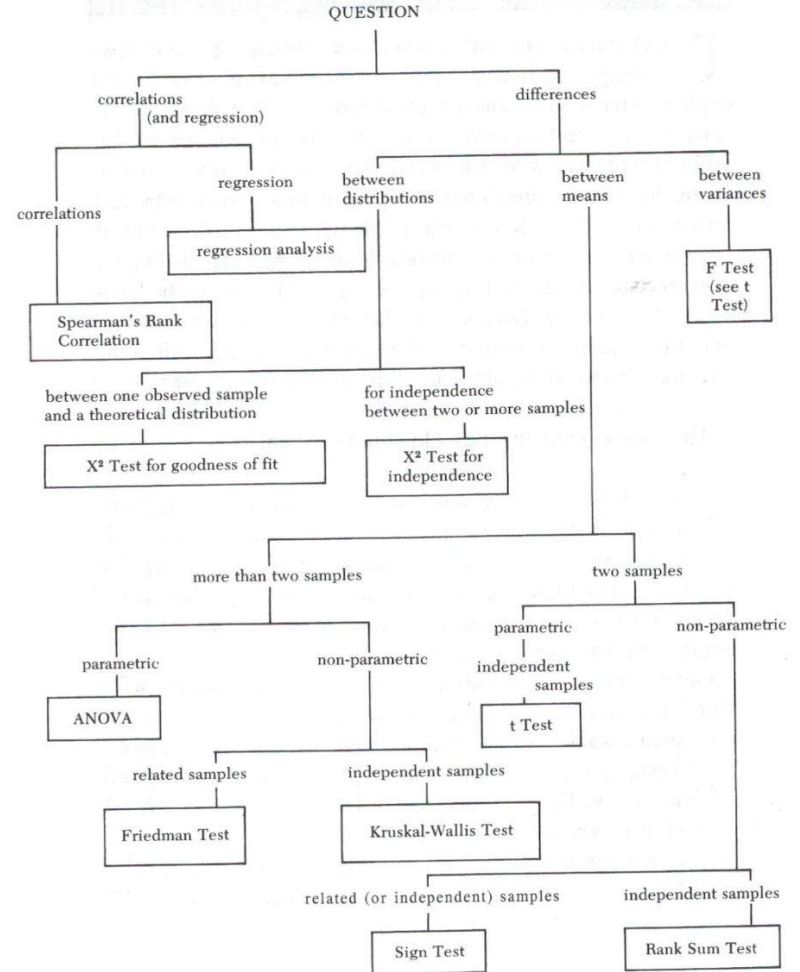
Laura D. Frost

Comprehension:

Guide information processing and visualization



Comprehension: Highlight patterns, big ideas, & relationships Guide information processing & visualization



From: Ambrose, H.W. and Ambrose, K.P., 2007. A Handbook of biological investigation. Hunter Pub. Co..

Comprehension: Guide information processing & visualization

SCIENTIFIC PROCESS 15.1

Mesotocin and sociality in zebra finches

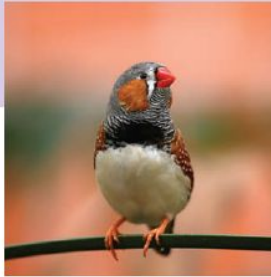
RESEARCH QUESTION: *How do hormones affect sociality in zebra finches?*

Hypothesis: Endogenous MT promotes sociality in zebra finches.

Prediction: Individuals with higher MT levels will spend more time with larger groups.

Methods: The researchers:

- Fitted subject birds with cannulae and used intracerebroventricular infusions of 50 ng MT or saline.
- Used either two or ten same-sex conspecifics in each end compartment.
- Recorded the perch used every 15 seconds for five minutes. Close proximity was defined as using the perch closest to a side chamber.



Results:

- Females treated with MT increased the amount of time spent near a large group.
- Males treated with MT did not increase the amount of time spent near a large group.

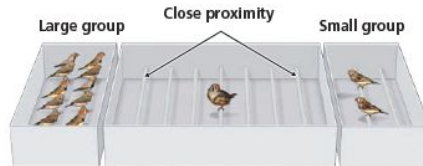


Figure 1. Choice test apparatus. The subject bird was in the middle compartment and the two end compartments contained either two or ten same-sex conspecifics. (Source: Goodson et al. 2009)

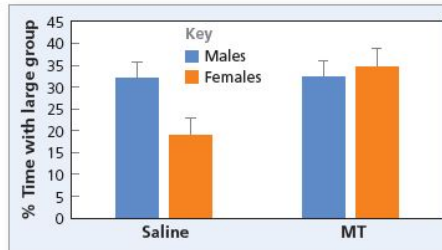


Figure 2. Choice of large group. Percent of time spent in close proximity of the large group for males (blue) and females (orange) for saline- and MT-infused birds. (Source: Goodson et al. 2009).

Conclusion: Central infusions of MT influence sociality in female, but not male, zebra finches.

Discussion Time / Thank You!

Now how do you feel on a 1 - 10 scale to answer these (10 is very or high)

1. How present are you for this experience right now?
2. Where do you locate your skill set in terms of textbook design for equity and accessibility?
3. How comfortable are you in talking with your publisher about textbook design?

Based on the above numbers earlier have any of these numbers moved and if so what led to that?

What might you still want to know about?

References & Resources

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Web Aim: Link Contrast Checker: <https://webaim.org/resources/linkcontrastchecker/?fcolor=0000FF&bcolor=FFFFFF>