

- 1 **Chapter 1**
Scientific Thinking
- 2 **1.1**
 - Science
 - A way to learn about and understand the world
 - Relevance of science
 - Understanding enables you to make your own decisions
 - Biology
 - Study of living things
- 3 **1.2**
 - We will look at biology using a scientific approach to increase your Scientific literacy
 - Think creatively about real biological issues
 - Communicate your thoughts to others
 - Integrate ideas when making decisions
 - Global warming? Fossil fuel use? Stem cells? GMO's?
- 4 **1.3 Scientific Method**
 - Superstition
 - Belief that actions not related to event influence the outcome
 - Scientific Method
 - Series of observations & experiments
 - If results do not support original ideas they MUST be modified
 - Empirical
 - Rational, testable, repeatable
- 5 **1.4 -1.9 Thinking like a Scientist**
 - Not a single pathway...adaptable process
 - Basic steps
 1. Make observations
 2. Formulate a hypotheses
 3. Devise a testable prediction
 4. Conduct a critical experiment
 5. Draw conclusions & make revisions
- 6 **Small Group Activity (3-4/group)**
 - Each group will draw one of the following questions.
 1. Eyewitness testimony
 2. Echinacea & common cold duration/intensity
 3. Chemical runoff & hermaphrodite fish
 4. Shaving & coarser darker hair
 - Describe what occurred in each step of the scientific method to accept or reject the hypothesis
- 7 **1.10 What are Theories**
 - Common use of the word theory?
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 - Scientific use of the word theory
 - Broad statements
 - Repeated testing over time with ALL results supporting the theory
 - As close to fact as science can get
- 8 **1.11 Experimental Variables**
 - Treatment
 - Experimental condition applied to research subjects

- Experimental group
 - Exposed to treatment
- Control group
 - Identical treatment but not exposed to treatment
- Variables
 - Subject to change
 - Minimized between experimental & control group
- 9 **Cont.**
 - Blind experimental design
 - Subjects do not know which treatment they receive
 - Double-blind
 - Subjects & experimenter do not know
 - Randomized
 - Subjects randomly placed in groups
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 - Results can only be explained by treatment effects
- 10 **Examples**
 - Gastric freezing Clever Hans
- 11 **1.2 Repeatable experiments**
 - AIDS Cure
 - Linus Pauling - mega doses Vit. C treat cancer
- 12 **1.13 Biases**
 - Gender bias
 - Subconscious tendency to skew data in favor of your expectations
- 13 **1.4 Statistics**
 - Analytical and mathematical tools to gain understanding from data
 - “correlation is not causation”
- 14 **Cont.**
 - Random appropriately sized sample
 - Average & variation
- 15 **1.15 Misleading evidence**
 - Pseudoscience
 - Not supported by trustworthy scientific studies
 - Anecdotal observations
 - Very few observations which cause people to link two things
- 16 **1.16 Limits to science**
 - Limited to what can be observed and measured
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 - Science cannot address many questions
 - Supernatural
 - Religious
 - Unexplained phenomena
 - Artistic expression
 - practical limits
- 17 **1.7 Biology themes**
 - Recurring themes
 - Hierarchical organization
 - Evolution
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- Recurring themes connect diverse topics
 - Chemical, cellular & energetic foundation of life
 - Genetics evolution & behavior of individuals
 - Diversity & unity of life
 - Ecology, environment & organisms