

Unifying concepts and processes help students think about and integrate a range of basic ideas which builds an understanding of the natural world.

| Big Idea (Unifying Concepts and Processes) | definitions | Learning goals & other ideas- | Student demonstrations: (by end of first grade, Nebraska Science Standards) | Other Examples |
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| Systems, order, organization | <p>-Smaller units that help us understand and make predictions about the larger, complex world</p> <p>-System is an organized group of related parts that form a whole</p> <p>-Order- behavior of units of matter, objects, organisms or events in the universe. It can be described statistically</p> <p>-organization- hierarchic and systematic way of thinking about the world</p> | <p>-Take away part and it changes or fails. -Systems evolve</p> <p>-Systems Goal: Think and analyze in terms of systems</p> <p>-Order Goal: help students develop knowledge about factors influencing objects, organisms, systems, or events</p> <p>-Organization goal: help students describe physical and living systems at different levels of organization.</p> | <p>-Use one or more of the 5 senses to observe objects within the student's environment</p> <p>-Use observations to sort objects by their characteristics</p> | <p>systems- can be thought of as any collection of things that have some influence on one another</p> <p>EX-organisms, machines, fundamental particles, galaxies, ideas, numbers, transportation, educational system; solar system; educational system; physiological system; weather</p> <p>-types of organization: periodic table of elements; classification of organisms</p> <p>-levels of organization of Physical systems: particles, atoms, molecules</p> <p>-Levels of organization of Living systems: cells, tissues, organs, organisms, populations, and community</p> |

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| <p>Evidence, Models, and Explanation</p> | <p>-evidence-observations and data to base scientific explanations</p> <p>-models- schemes or structures with explanatory power that correspond to real objects, events or classes of events; a simplified imitation of something to help us understand it better</p> <p>-Explanations- provide interpretation, meaning or sense to objects, organisms, or events; incorporate existing scientific knowledge & new evidence from observations, experiments, or models into internally consistent logical statements.</p> | <p>-Scientists use models to study what can't be easily observed.</p> <p>-They use models and evidence to form explanations about world.</p> <p>-Caution-models may be misleading and cannot be expected to represent the full-scale phenomenon with complete accuracy</p> <p>-Evidence Goal: help students use evidence to understand interactions and predict changes</p> <p>-Models goal: help students learn to make and use many models</p> <p>Explanations goal: help students create explanations which incorporate a scientific knowledge base, logic, and higher levels of analysis.</p> | <p>-Describe and record how a model, such as photos, maps, globes, illustrations, stuffed animals, toys, and building blocks can represent an object, living thing, or an event</p> <p>(Many misconceptions in explanations represent errors common to well-recognized developmental stages of children.)</p> | <p>Models – physical objects, plans, mental constructs, math equations, computer simulations</p> <p>A model may be physical, mathematical, or conceptual. EXs-a plan, device, drawing, equation, computer program or mental image, metaphor</p> <p>-Explanations- hypotheses, laws, principles, theories</p> |
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| <p>Constancy, Change, and Measurement</p> | <p>-Constancy-uniformity in nature, value, and extent</p> <p>-Change-making something different; Changes in systems vary in rate, scale, and pattern including trends and cycles.</p> <p>-Measurement-quantitative observations about objects, events, or systems</p> <p><i>Scales</i> –different characteristics, properties or relationships within a system might change as its dimensions are increased or decreased</p> <p><i>rates</i>-comparing one measured quantity with another; a measure of change for a part relative to the whole</p> | <p>-Constancy goal: help students recognize those conditions or values that cannot change or be changed</p> <p>-Change goal: students identify and measure changes in properties of materials, positions of objects, motion, and form and function of systems.</p> <p>-Measurement goal: help students use tools of measurement and measurement systems to achieve understandings of scales and rates</p> <p>-We can observe and predict some patterns of change and measure and record how things are alike and different (to identify patterns.)</p> <p>-Analysis of change can help our understanding and prediction</p> <p>-Change can be altered or stopped by outside influence and/or the removal of one or more element in the change.</p> | <p>-Recognize that change can be noted and measured.</p> <p>-Recognize that things change in some ways and stay the same in others.</p> <p>-Compare 2 or more objects using direct comparisons of measurement such as shorter, longer, taller, heavier, and lighter</p> <p>-Use both standard units of measurement such as inches and centimeters and nonstandard units of measurement such as string and paper clips.</p> <p>-Use appropriate measurement systems for different purposes.</p> | <p>-Constancy-speed of light; charge of an electron; total mass plus energy in the universe</p> <p>-Changes occur in properties of materials, positions of objects, motion, and form and function of systems</p> <p>-Energy can be transferred and matter can be changed, but when measured, the sum of energy and matter in systems remains the same</p> <p>-Evidence for interactions and subsequent change and the formulation of scientific explanations are often clarified through quantitative distinctions (measurement). Rates ex: 60 miles per second; birth rate as part of population growth</p> <p>-Designing and engineering is interested in ways in which systems do not change</p> <p>-Changes can occur in steady trends, cycles, or be irregular</p> |
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| <p>Evolution and Equilibrium</p> | <p>-Evolution- series of changes, some gradual and some sporadic that account for the present form and function of objects, organisms, and natural and designed systems</p> <p>-Equilibrium-physical state in which forces and changes occur in opposite and off-setting directions</p> | <p>-Evolution goal: Students to recognize that the present arises from materials and forms of the past.</p> <p>-Equilibrium goal: Students to recognize systems that are in equilibrium</p> <p>-Everything evolves.</p> <p>-Evolving implies a change that occurs due to environmental changes over time.</p> <p>-Entropy, a law of physics, says that everything deteriorates over time</p> <p>-Equilibrium is nature's way of keeping itself balanced.</p> | | <p>Evolution does not occur in isolation. EX A long-steady climate may lead to extinction of species that have become well adapted to it.</p> <p>Evolution applies loosely to language, literature, music, political parties, nations, science, mathematics, and technological design. Each new development grew out of preceding forms and so on.</p> |
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| Form and function | <p>Form-shape of an object</p> <p>Function-normal or characteristic action of anything.</p> | <p>Form goal: use form to explain function</p> <p>Function goal: use function to explain form</p> <p>-Form and function are complementary aspects of objects, organisms, and systems in the natural and designed world.</p> <p>-Function of an object relies on the form it needs to take.</p> <p>-The form of an object relates to its function, use or operation. (what it does).</p> <p>- Changes in form evolve as functions change over time</p> | <p>-Demonstrate how the shape of a tool is related to its use.</p> <p>-Explain how living things interact with their environment because of specific characteristics such as how the long neck of a giraffe helps it to reach its food.</p> | Form and function |
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-This chart was made using the Big Ideas Section of the Appendix in the NB portfolio instructions, Sinetag's explanation of Big Ideas (from the science AC chat on May 15th) and the Nebraska Science Standards (<http://www.nde.state.ne.us/ndestandards/sciencedrft.htm>) and *Science for All Americans* online chapter 11: Common Themes (<http://www.project2061.org/tools/sfaaol/chap11.htm>)