The purpose of this exercise was to practice taking apart learning objectives to articulate cognitive processes, content, and examples. In practice a teacher must identify the goal clearly to students and identify the standards by cognitive process and academic content. By doing this the student will have a distinct target and goal for their learning.

I. Indicator & Descriptor - E2, 6-8. d. (p.20)
Describe how matter and energy change from one form to another in living things and in the physical environment.

Cognitive process: Describe

Content: matter, energy, change of form, living things, physical environment

Examples of each content concept?

- **Matter**: Organic molecules, carbon based, metals, gases
- **Energy**: ATP, cellular respiration,
- **Change of form**: Ecological food chain, transfer of energy from producer to consumer to secondary consumers,
- **Living things**: Types of living things (kingdoms- plant, animal etc.), carbon based
- **Physical environment**: biomes, communities

What learning experiences do students need to have to reach this performance indicator?

In order for students to gain the knowledge to reach this indicator they would need to obtain knowledge of materials on ecosystems, specifically focused at the transfer of energy in a food web. Students should be exposed to materials that will enable them to be able to predict changes in a food web or eco-system when things like extinction happen.

How is this best learned?

**Online**: See movies webinars, gather information, and see examples

**Seminars**: Classes to give direction, cover core concepts discuss possible outcomes from environmental influences or influences from humans.
Lab work- Grow plants see how animals and insects interact.
Projects- Grow a garden or look at plants around community to show or describe how energy moves through a food web and ecosystem. Another example- Research the impact the Asian crab has on the ecosystem in the northeast, what are the implications of their arrival to the area and what can be done to curb their inhabitance of the area?

II. Indicator & Descriptor- C3, 6-8. c. (page 11)

*Identify the factors that influence the development and use of science and technology.*

Cognitive process: Identify

Content: Influence, development, use, science, technology

Examples of each content concept?

**Influence**- Influences of factors in the environment, in one’s daily life, influences in different types of populations

**Development**- Development of scientific knowledge tools, development of populations in nature

**Use of science**- cure illness, understanding the environment and ecosystems we live in, morals of scientific experimentation

**Use of technology**- Development of technology does technology drive science or does science drive the need for technology?

*What learning experiences do students need to have to reach this performance indicator?*

For students to reach this indicator they must gain the necessary knowledge to be able to IDENTIFY the factors that have driven scientific advancement and how technological design has progressed.

*How is this best learned?*

**Online**- Gather information the historical achievements in science and how they drive modern day accomplishments, see examples of technology, see what professionals are doing in the field,

**Seminars**- Discussions on ethics, make sure students have a clear understanding of the importance of the ethical issues.

**Lab work**- Learn about and use the tools which will help you understand science

**Projects**- Projects to communicate why we need to learn about science and identify the importance of advances in technology
III. Indicator & Descriptor- E4, 6-8, b. (page 23)

Identify some risks to the development of an embryo including mother’s diet, lifestyle, and hygiene.

Cognitive process: Identify

Content: embryo development, diet, lifestyle, hygiene, healthy and risk

Examples of each content concept?
- Embryo development- Stages of development, what is forming
- Diet- Nutritional input to one’s body, important nutrients
- Lifestyle- Effects of an unhealthy lifestyle
- Hygiene- Importance of hygiene, how viruses spread
- Healthy- Good health habits
- Risks- risks in our environment, health implications

What learning experiences do students need to have to reach this performance indicator?

Students must learn about how a fetus develops and be able to identify risks in our environment and be able to specify what can happen in certain situations during development.

How is this best learned?
- Online- see the actual development of an embryo, gain knowledge of risks and outcomes
- Seminars- discuss issues on concepts such as gene modification
- Lab work- Students could look at viruses and bacteria to see how they function in nature
- Projects- Student display or communicate somehow the steps and risks in embryo development. Students could symbolize with graphs the risk of alcohol fetal syndrome and show what stages of development are most at risk and the result of the disease with another visual display.

IV. Indicator & Descriptor- E3, 6-8. a. (page 21)

Describe functions of organisms carried out within cells including the extracting of energy from food and the elimination of wastes.

Cognitive process: Describe

Content: Organisms, cells, functions, energy, cellular respiration, elimination of waste
Examples of each content concept?

- **Organisms** - unicellular vs. multicellular, vs. bacteria
- **Cells** - plant & animal cells, different types and functions of cells
- **Functions** - electron transfer, osmosis, photosynthesis, stomata,
- **Energy** - ATP, ADP, AMP, sugars carbohydrates
- **Glycolysis** - The extraction of energy from food.
- **Elimination of waste** - carbon dioxide, oxygen, and nitrogen cycles

**What learning experiences do students need to have to reach this performance indicator?**

For students to reach this descriptor they must gain the knowledge to understand generalized cell structure and functions of parts of a cell. Then be able to recognize and classify different types of cells.

**How is this best learned?**

- **Online** - see examples online, watch videos of processes
- **Seminars** - discuss functions of cells,
- **Lab work** - look at cells under microscopes
- **Projects** - do certain activities like a jig-saw project having the student break up into groups and represent different cells or structures.

V. Indicator & Descriptor - E4, 6-8. a. (page 22)

*Explain that sexual reproduction includes fertilization that results in the inclusion of genetic information from each parent and determines the inherited traits that are part of every cell.*

**Cognitive process:** Explain

**Content:** sexual reproduction, fertilization, DNA & RNA, traits, genes,

**Examples of each content concept?**

- **Sexual reproduction** - Sexual vs asexual reproduction
- **Fertilization** - meiosis, mitosis
- **DNA&RNA** - cellular blueprint
- **Genes** - parental input
- **Traits** - results from mixing genes, Punnett Squares
What learning experiences do students need to have to reach this performance indicator?

Students should research the different types of sexual reproduction and be able to predict the outcomes of genetic crossing.

How is this best learned?

**Online**- see the cellular process in video, look at gene information

**Seminars**- discuss certain issues like gene therapy or genetic modified food

**Lab work**- predict outcomes of crossing certain plant grown in the lab

**Projects**- grow plants in lab do genetic research response groups.