Life Science Standard **LS1C**

Content Standard:

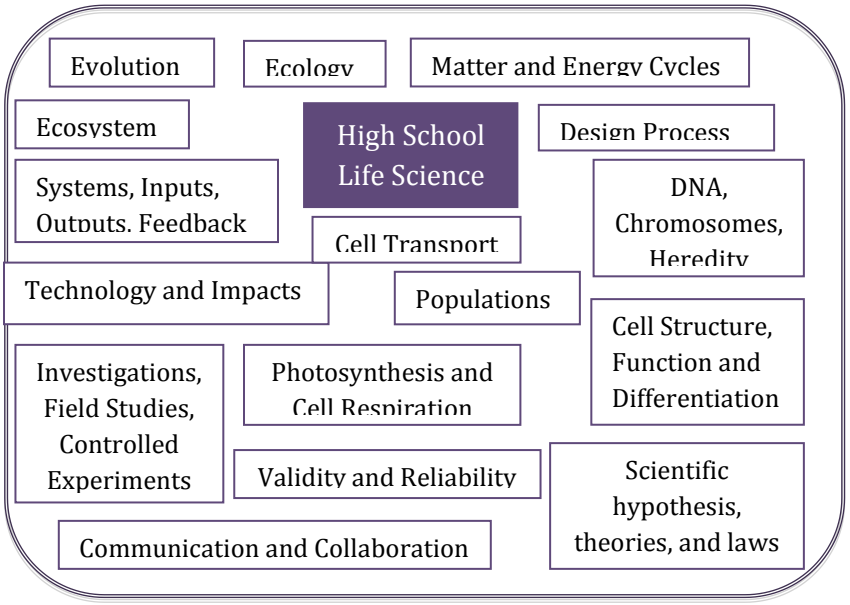
Cells contain specialized parts for determining essential functions such as regulation of cellular activities, energy capture and release, formation of proteins, waste disposal, the transfer of information, and movement.

Performance Indicators:

Draw, label, and describe the functions of components of essential structures within cells (eg. cellular membrane, nucleus, chromosome, chloroplast, mitochondrion, ribosome).

Item Specifications:

- Describe the essential function(s) of structures within cells (i.e., cellular membrane, cell wall, nucleus, chromosome, chloroplast, mitochondrion, ribosome, and cytoplasm).



Reflective Questions for Students:

- How does the parts of a cell make it function as a system?
- How do the functions of the cell parts help it function as a system?
- How have new theories changed our thinking about the cell?

When you think about the answers to these questions, think about models that you could develop.

Assessment Information

http://www.k12.wa.us/Science/Assessments.aspx

Quick Links for Students:
Use the following links to explore your understanding of cell organelles and their functioning.

- A table of organelles, their descriptions, their functions, and plant vs. animal: http://www.schools.utah.gov/curr/science/sciber00/7th/cells/sciber/orgtable.htm
- An interactive online microscope of slides containing organelles: https://histo.life.illinois.edu/histo/lab/cells/text.htm
- A student-made organelle rap: http://www.youtube.com/watch?v=Xi9Kp9J4qK4A
- A clay-animation video about organelles: http://www.youtube.com/watch?v=n9zqs6acTeI&feature=related
- A tour of the cell: http://cellsalive.com/cells/cell_model.htm

Teacher Center
Elements of Effective Science Instruction

Disciplinary Core Ideas

Essential teaching components leading to the big ideas:

- Scope, sequence, and coordination based upon the national standards: http://dev.nsta.org/ssc/moreinfo.asp?id=1054

Additional supports and extensions for understanding how students grasp the concept:

- A site that provides background, as well as misconceptions and sample problems: http://www.rpdp.net/sciencetips_v2/L12B1.htm
- A tour of the cell: http://cellsalive.com/cells/cell_model.htm

Cross Cutting Ideas:
Designing for Learning

Strategies to reveal student understanding include:

- Paige Keeley's Formative assessment probes available through nsta.org
- Teacher's Toolkit: Misconceptions in the science classroom, Science Scope at www.nsta.org
  This article in Science Scope offers suggestions for identifying science misconceptions in general.
- Misconceptions:
  - Cells are comprised of a nucleus, protons, electrons, and neutrons
  - Atoms are made of cells
  - Cells are living; atoms are a separate thing and are non-living

Prerequisite knowledge required:

- All matter is made of atoms
- Atoms make up molecules, such as the 4 biomolecules: proteins, nucleic acids, carbohydrates, and lipids
- Proteins, nucleic acids, carbohydrates, and lipids make up the organelles which are found in and make up cells

Learning progressions for mitosis include:

- Use modeling kits to build biomolecules and link this to building cellular structures, such as the cellular membrane (as it contains lipids and proteins).
- Tour the cell
- Have students build a model, make a poster, create a song or rap,
- Give students an analogous system, such as a city (with a fence and a post office, etc), and have them link these analogous components with the organelles with supportive explanation.

Scientifically oriented questions focused on clarifying and extending student understanding include:

- Do plants have mitochondria? (Important link to cellular respiration)
- What kinds of organisms have a nucleus?
- What would happen to someone born with abnormal ribosomes?

Activities supporting opportunities for students to make claims, use evidence and communicate reasonings include:

- **SYSTEMS (EALR 1):**
  Analogous system, such as a city (see "Learning Progressions")

An energy diagram for light energy transforming into chemical energy in the chloroplasts of producers.

- **INQUIRY (EALR 2):**
  N/A

- **APPLICATION (EALR 3):**
  A collaborative study on an issue, such as mitochondrial myopathy.

- **LIFE SCIENCE (EALR 4):**
  A cell structure and transport project:
  http://www.rpdp.net/adm/uploads/science/424ProjectandRubricEukaryoticCell.pdf
  A story whose characters represent organelles; it also covers the evolution of the Eukaryotic cell:
  http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=301&id=301

Cross Cutting Ideas: ***Sense Making***	**Cross Cutting Ideas:** ***Classroom Culture and Environment***
Planning time in the lessons to support time for students to make sense of what they are learning include: Using a system, such as a city, as an analogy to a cell allows students to construct their own understanding of the functions of organelles.	**Activities that show how this standard relates to students' everyday lives include:**
Strategies to focus on student conversations, interactive notebook prompts, model-building include:	**Activities that show how scientists think and do science in relationship to this content standards include:**