Understanding by Design*

The *Understanding by Design* template focuses on the three stages of backward design:

- **Identify desired results**
- **Determine acceptable evidence**
- **Plan learning experiences**

What overarching (enduring) understandings are desired?

Home wind generators have limited power and energy outputs.

- Home housing circuits are set up as parallel circuits so that any appliance can be on or off without affecting other appliances.
- All circuits follow a few simple physics principles for determining current, power and voltage.
- Heating water requires more energy than heating many other materials.
- There are cost and energy efficient ways to heat water.

What will students understand as a result of this chapter?

A closed circuit is required to light a bulb.

- An electron shuffle model can help illustrate how electrical energy of the battery is delivered to appliances.
- In some resistors (obeying Ohm's law), the ratio of voltage to current is constant.
- A circuit breaker and/or a fuse can limit the current in a circuit.
- Specific heat of materials defines the energy required to change the temperature of the material.
- Microwaves, hot plates and heating coils use different amounts of electricity to heat water.
- Methods of energy transfer include convection, conduction and radiation.

What are the overarching "essential" questions?

How can electricity be generated?

- What model can be used to effectively describe electrical circuits?
- How are resistance, voltage, current and power determined in an electrical circuit?
- Which appliances for heating water are the most efficient?
- How is electrical energy related to heat energy?

What "essential" questions will focus this chapter?

What is a closed circuit?

- How does the "electron shuffle" model of electricity help explain current, voltage and power?
- How are series and parallel circuits different and under what circumstances is each used?
- What is Ohm's law?
- How can fuses protect circuits?
- What is the most efficient way to heat water?
- Describe and compare convection, conduction and radiation.
- How much electrical energy is required to raise the temperature of water?

* Grant Wiggins and Jay McTighe, *Understanding by Design* (Merril/Prentice Hall, 1998), 181.

CHAPTER 6