Sequencing Rationale: Chemical Interactions

 The chemical interactions unit is sequenced in a way to capture students’ attention, engage them through inquiry, and assist them in developing their own ideas. Students experience science through lab experiences, develop ideas and explanations, and then discuss the science terminology used to describe their own ideas.

The unit begins with an investigation that hooks students by observing a chemical reaction take place. Students are posed with the challenge to determine what the substances are that were mixed with water to cause that reaction to take place. This lab, and the substances involved, is referred to throughout the remainder of the unit.

Once students determine what substances make up this mystery mixture, the unit progresses into elements. Students have seen chemical formulas throughout their investigation of the previous challenge. Now they understand what the elemental symbols mean. Students apply this information to the real world as they look at the labels of common household products and determine what elements are included directly or can be determined based on substance name.

From this point, students move into discussion of particles. Using the mystery mixture to create gas, students begin to make observations about gases. Students are given materials and through a series of observations they are able to describe what happens when air is compressed and expanded (although terms are applied after the experience). By the end of this subunit, students are able to illustrate what the particles look like and how they would move through a representation.

Once students understand particles and that they are always moving, we build upon their movement even more with discussion about kinetic energy. Students are asked to design a demonstration to show younger children what happens when air is heated and cooled (after discovering themselves what happens). Students use their experience to develop their own explanation of what is happening to the gas particles. Once an explanation is agreed upon, the concept of contraction is introduced. Students are now asked to apply the concepts of expansion and contraction to liquids as they create their own thermometer (not temperature accurate). Students observe the changes to a solid through a teacher demonstration at the end, but should be able to explain what is happening based on prior experiences.

As students grasp the concepts of particles and kinetic energy, this knowledge is used to develop the concepts of energy transfer. Students begin by designing an experiment to collect data and determine what happens when warmer and cooler water are mixed. Through discussion, students understand particle collisions. They use this information to develop ideas about phase changes. Information about each phase is presented to students. Through new and prior lab experiences, they develop ideas about how these changes from state to state occur.

In the subunit on phase changes, students also observe dissolving. In the solutions subunit, students design their own experiment to test saturation. Students try to see if there is a limit to how much can dissolve and if that varies for different substances. They also try to create a way to figure out exactly how much can be dissolved. After the experience, the term saturation is introduced.

The final subunit is about reactions. Now students apply all the concepts they have learned to examine chemical reactions. First students show representations of atoms and elements using the chemical formulas from the first investigation. They use these representations to illustrate what happens to substances during a chemical reaction through representation of the chemical reaction from the first subunit and new observations of other reactions.