**Outline of Unit Activities for Building a Small Particle Model of Matter**

|  |  |  |
| --- | --- | --- |
| **Question** | **Key Idea** | **Contribution to particle model** |
| Prior lesson: What is matter? | Matter has volume (“takes up space”) and mass (related to “how heavy” it is). Measurable properties can help us categorized objects as solid, liquid, or gas. | Students infer that even tiny objects (e.g. a grain of sand) are matter. [This leads later to accepting that particles that are too small to see can still take up space/have mass.] |
| Prior lesson: Do objects with the same mass have the same volume? | Two objects can have identical volume but different weight.  | Students develop a rudimentary particle model to explain these differences. |
| 3rd lesson: Do the mass and volume of a gas ever change? | We can change the volume of gas (compress or expand) without changing its mass.  | Students recognize that there must be empty space between the particles of gas. |
| This lesson: What properties stay the same when we break an object into pieces? | Essential properties are those that the material must have, no matter what its size.  | Students can explain differences that they observe in materials by visualizing each material’s *particles* as having their own, unique properties. |
| Later lesson: Can matter disappear? | When we dissolve sugar, the matter is still there, even though we can’t see it. | Students explain dissolving by thinking about the spaces between particles of water. |
| Later lesson: How does heat affect matter? | When water is heated, the sugar dissolves more quickly. When gas is heated, it expands. | Students explain observations by adding motion to their particle models. The greater the temperature, the greater the motion of the particles. |
| Later lesson: What happens to water during evaporation?  | Water does not disappear when it evaporates. A closed system can help us observe that mass (weight) is conserved.  | Students further develop their particle model to include conservation of mass and use it to explain what happens during evaporation. |