Appendix A

A Physical Science I Activity Before and After the Course Text Revision

**Before the revision:**

*The area of a surface is the number of unit squares it takes to cover that surface exactly. Find the surface areas of some geoblocks. Draw a crooked, curvy figure on a piece of graph paper and find its area. Find the area of a circle.*

*The weight of a piece of material is determined by its volume. When the thickness and width are held fixed the volume is proportional to the length. When only the thickness is constant, the volume is proportional to the area.*

*Find the volume of some geoblocks. To help, we have made available a large number of small cubes, one centimeter on an edge. How many of these does it take to make a cube two centimeters on an edge? Three centimeters? Check your answers.*

*The volume of an object is the number of unit cubes required to fill exactly the same space as the object does. How is this related to the formula length times width times height? How can you apply this definition to finding the volume of a cylinder? Can you make a graduated cylinder? Do so, and use it to find the volume of something irregular, such as a rock.*

**After the revision:**

*Estimating, measuring, and calculating area.*

1. *"Length times width" is a formula that you may have used to calculate area in the past. For what shapes is it appropriate to use this formula to calculate area?*
2. *The formula for the area of a triangle is Area = ½ (base) x (height). Let’s see if we can determine where the “½” comes from in this formula.*
3. *Draw a rectangle below, and then draw a diagonal line from one corner of the rectangle to the opposite corner. Shade in one of the two triangular shapes. Based on your drawing, why does it make sense that the formula for an area of a triangle is Area = ½ (base) x (height)?*
4. *In the appendix, you will find two figures traced onto a piece of graph paper. Cut a 1 cm x 1 cm square (a square centimeter) out of scrap paper. Estimate how many of these squares would be needed (approximately) to cover each of the two figures. Record your answers (in square centimeters, or cm2) below:*

|  |  |
| --- | --- |
| *Estimated area for Figure 1:* | *Estimated area for Figure 2:* |

1. *Using any method(s) of your choosing, now calculate the area of the two figures in the appendix (in square centimeters) as accurately as possible. When finished, write your answers on the chalkboard so different groups can compare their results.*

|  |  |
| --- | --- |
| *Area for Figure 1:* | *Area for Figure 2:* |

*Your work:*

*Note: Your estimated answers from part (a) should be similar to your calculated answers in part (b). If your calculated and estimated answers are not similar, you should reconsider your method and redo your calculation.*

1. *Class Discussion: Area*

*Estimating and measuring volume and mass.*

*Scientists nearly always focus on mass rather than weight, and so volume and mass (rather than volume and weight) are the main foci of the activities below.*

1. *“Length times width times height" is a formula that you may have used to calculate volume in the past. For what specific shapes is it appropriate to use this formula to calculate volume?*
2. *Grab a beaker from the glassware shelf and verify (using a ruler and calculator) that at least two of the volume markings on the beaker are correct. (For this exercise, note that 1 cm3 is exactly equal to 1 ml.) Hints: What is the general shape of a beaker? How do you calculate the volume for this shape? If you aren’t sure, check with your instructor.*

*Your calculations:*

1. *Your instructor will hand your group two irregular objects (e.g., a rubber stopper and a test tube clamp). Think of all the different methods that you could use to measure the mass and volume of these two objects.*

*Possible methods for measuring mass:*

*Possible methods for measuring volume:*

1. *Class discussion: What are all the different methods that we could use to measure the mass and volume of the two objects?*