

**Figure 7** Wiping each dish in the same manner with a different paper towel is an important constant.

**Explain** why it is necessary to have a constant in your experiment.



**Soil Experiment** Suppose you wanted to design an experiment to find out what kind of soil is best for growing cactus plants. What would be your variables and constants in the experiment?

**Variables and Constants** The different factors that can change in an experiment are **variables**. However, you want to design your experiment so you test only one variable at a time. The variable you want to test is the brand of dishwashing liquid. This is called the **independent variable**—the variable that you change. **Constants** are the variables that do not change in an experiment. Constants in this experiment would be the amount of dishwashing liquid used, the amount of water, the water temperature, the number of dishes, the kind and amount of grease applied to each dish, the brand of paper towels that were used, and the manner in which each dish was wiped. For example, you might use 20 equally greasy dishes that are identical in size, soaked in 20 L of hot water (30°C) to which 10 mL of dishwashing liquid have been added. You might rub each dish with a different dry paper towel of the same brand after it has soaked for 20 min and air dried, as the student in **Figure 7** is doing. If grease does not appear on the towel, you would consider the dish to be clean. The amount of grease on the towel is a measure of how clean each dish is and is called the dependent variable. A **dependent variable** is the variable being measured.

**Controls** Many experiments also need a control. A **control** is a standard to which your results can be compared. The control in your experiment is the same number of greasy dishes, placed in 20 L of hot water except that no dishwashing liquid is added to the water. These dishes also are allowed to soak for 20 min and air dry. Then they are wiped with paper towels in the same manner as the other dishes were wiped.



**Reading Check**

Why is a control used in an experiment?