# TRB 5:1 - Activity 2: Sum of the Parts

## Summary

This activity will help students discover that the total weight of an object is equal to the weight of its individual parts after being disassembled.

## Materials

For Invitation to Learn:

- 1 package modeling clay
- scale

For each team:

- scale
- a collection of Legos, K-nex, or other similar building materials, (If Legos or K-nex are unavailable, your students may be willing to bring some from home for their teams to use.)

## Background for Teachers

“No matter how parts of an object are assembled, the weight of the whole object is always the same as the sum of the parts; and when a thing is broken into parts, the parts have the same total weight as the original thing. It is not obvious to elementary students that a whole weighs the same as the sum of its parts.” (The Structure of Matter: 3-5; AAAS Benchmarks) The following experiences will help your students to understand this relationship between wholes and their parts.
These activities are best done by small groups of 3-5 students. It is important that each group has access to a scale that can accurately measure 1-gram increments. If scales are not available, the activities can be done as a teacher demonstration.

## Intended Learning Outcomes

1-Use science process and thinking skills
4-Communicate effectively using science language and reasoning.

## Instructional Procedures

Invitation to Learn:
Show the class a ball of modeling clay and have them name its physical properties. List their responses on the board. Remind students that weight is a physical property. Allow students to hold the ball and then have them make estimates of the clay 's weight. Record their estimates on the board. Weigh the ball of clay and compare it to their estimates. Record the
clay's weight on the board.
From the large ball of clay, break off a smaller ball for each team, and have the class list the properties of the smaller balls. (Students should notice that all the properties of the clay are the same except the size and weight of each ball has changed.) Have each team weigh their ball of clay and report its weight. Record the weights on the board.
Collect all the clay and mold it back into a large ball. Ask the teams to put their heads together and decide what they think the large ball of clay weighs. Have teams report the weight and explain how they arrived at it. Record responses. Weigh the clay and compare the weight to the teams' guesses and the weight of the original ball of clay. (The re-formed ball of clay will probably weigh less than the original ball because some of the clay will remain on the students' hands or desk tops. Ask the class to explain why the re-formed ball weighs less.) Tell the class they are going to further investigate the relationship between the weight of the whole and its parts.
Instructional Procedures:

Cooperative teams of 3-5 should complete the following procedures: (see Team Procedures)

Build an object using the materials provided. Make sure your completed object can be placed on the scales to be weighed.

After you have completed your object, make an estimate of its weight and record your estimate on a journal page. You may want to weigh some of the individual building pieces to help you make your estimate.

Place your object on the scale and find its weight. Record the object's weight in your journal. Compare the actual weight to your estimate. How close was your estimate to the actual weight?

Take your object apart. Do not mix up the pieces used to build the object with extra building pieces. Make an estimate of the total weight of the pieces. Record your estimate.

Place all of the pieces used to build the object on the scale and find their total weight. (You may need to place the pieces in a bag to weigh them. If you do, be sure to weigh the bag first so you can subtract its weight from the total weight.) Record the total weight of the pieces. Compare the actual weight to your estimate.

Write a mathematical equation that shows what you have learned from this activity, such as: total weight of the pieces=total weight of object Write a statement that explains how the weight of the parts relates to the weight of the whole.

After students have completed the activity, have the teams share with the class what they have learned. Discuss the statement: "The weight of the arts is always equal to the weight of the whole." Is this statement always true? Can you think of a time when it may not be true? Can it be tested? How? What are some investigations that you could do to test the statement? You may wish to allow students to set up other investigations to test the statement.

## Extensions

Have students take apart broken appliances such as: radios, tape players, VCRs, computers, etc., and compare the weights of the item to the weight of the parts. Be sure to address safety concerns such as: never use TVs or computer monitors, and always wear safety glasses.

At the beginning of the day, give each student a new pencil. Weigh one pencil and calculate the total weight of all the pencils. Have students sharpen their pencils in the same pencil sharpener and use only that pencil during the day. At the end of the day collect all the pencils and the shavings from the sharpener. Weigh the shavings and the pencils. What parts of the pencils could not be collected? (The graphite used for writing and the erasers used for removing graphite). Challenge students to write an equation to calculate the weight of the graphite and erasers used during the day.

shavings (bag holding shavings) + used pencils + graphite and erasers not collected = total new weight of pencils.

Have students fill in the values and solve for the graphite & erasers.

## Assessment Plan

Use this rubric to assess your students ' performances:

Student 's Name _____

| | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| Journal Page | Descriptions and data clear and accurate. All observations completed. | Descriptions and data mostly clear and accurate. All observations completed. | Descriptions and data somewhat clear and accurate. All obervations | Descriptions and data unclear and inaccurate. All observations incomplete. |

| | | | | |
|---|---|---|---|---|
| | | | incomplete. | |
| Participation in Activity | Used time well and focused attention on the activity. | Used time fairly well. Stayed focused on the activity most of the time. | Did the activity but did not appear very interested. Focus was lost on several occasions. | Participation was minimal OR student seemed negative about participating. |

## Bibliography

This lesson is part of the Fifth Grade Science Teacher Resource Book (TRB3) http://www.usoe.org/curr/science/core/5th/TRB5/. The TRB3 is designed to be your textbook in teaching science curriculum to your students. This book covers all the objectives of each standard and benchmark. If taught efficiently, a student should do well on the End-of-Level (CRT) tests. The TRB3 is designed for teachers who know very little about science, as well as for teachers who have a broad understanding of science.

## Authors

Utah LessonPlans