

Mass

3rd or 4th Grade

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Benchmarks:

(3rd) SLC 3: Students will compare relationships in units of metric measurement (i.e., a kilometer is larger than a meter) (i.e., heavier, lighter, longer, shorter, etc.) between measured objects and select appropriate unit of measure.

(4th) SLC 3: Students will use metric measurements given for two and three-dimensional objects to determine a size relationship between those objects.

Objectives:

The students will come away with the knowledge that mass is a property of objects that can be measured. In addition, they should understand that simply because a particular object is larger than another doesn't always imply that it is more massive. The goal will also be to give them exposure to balances and their purpose as well as the units of measurement associated with mass.

Materials:

- Triple beam balances
- Several objects of varying masses and sizes

Initial Observation:

Place two books—one very large and massive book in addition to one small and less massive book—at each table. Have the students compare the books, and record their observations. If the students do not know what an observation is, now would be a good time to explain that. Regroup and have each table share their observations. Write them on the board.

Target Observations:

- One book is heavier than the other
- One book is bigger than the other
- The heavier book is the bigger book

Discussion:

From here, ask the students how they know that something is heavier than something else. Most of them will probably say to use a scale. From there ask them if their weight would be the same in space. Discuss how astronauts float in space, therefore showing that weight is different depending on how much gravity there is. From there ask if the astronaut would be made out of the same amount of stuff in space as he is on Earth, or if the stuff he/she was made out of would change when they travel to space. Hopefully they will reach the conclusion that they are still made out of the same stuff. From this point, you can differentiate between the terms weight and mass.

A scale measures weight—do we use a scale to measure how much stuff something is made out of too, or do we use a different instrument? At this point, we can

introduce the balance. Ask, too, if they think the bigger book might be more massive also.

Target Observations:

- People weight less in outer space than on earth – they’re weightless
- People are made of the same “stuff” in outer space as on earth
- More stuff means more weight – the big book should have more mass than the small book.

Target Model:

-Weight and Mass are not the same thing:

-Weight depends on where the person is (i.e. earth, space, etc...)

-Mass measures the amount of stuff there is, and is the same no matter where you are.

-Weight is measured with a scale

-Mass is measured with a balance

-Heavier things have more mass than lighter things

Procedure:

After discussing the proper treatment of the equipment, give each table a few objects, and give the students some time to determine how much mass each object has. This would be a good time to discuss units and their importance. Also discuss the difference between gram, kilogram, centigram, etc.

Bring the class back together, and focus their attention once again on the previous observations about the books. Point to their observations that the bigger book was also massive, and ask if this is always the case. “Are bigger objects always more massive than smaller objects?” They may have different ideas at this point, but to determine the correct answer, have each table come up with an experiment to test this question. Provide each table with different objects (some which are lighter, but bigger than the heavier objects at the table). Approve their ideas and allow them to do their tests, while recording their measurements. After their tests, discuss their results. They should have determined that bigger objects aren’t always more massive—if not, guide their tests until they reach the desired conclusions.

Target Observations:

- Mass is measured in grams, centigrams, kilograms, etc...
- The bigger book had more mass
- Some big objects, like a balloon, are lighter than small objects, like an eraser

Target Model:

-Weight and Mass are not the same thing:

-Weight depends on where the person is (i.e. earth, space, etc...)

-Mass measures the amount of stuff there is, and is the same no matter where you are.

-Weight is measured with a scale

-Mass is measured with a balance

-Heavier things have more mass than lighter things

-The size of an object says nothing about its weight or mass