

45 minutes

**Purpose of this lesson**

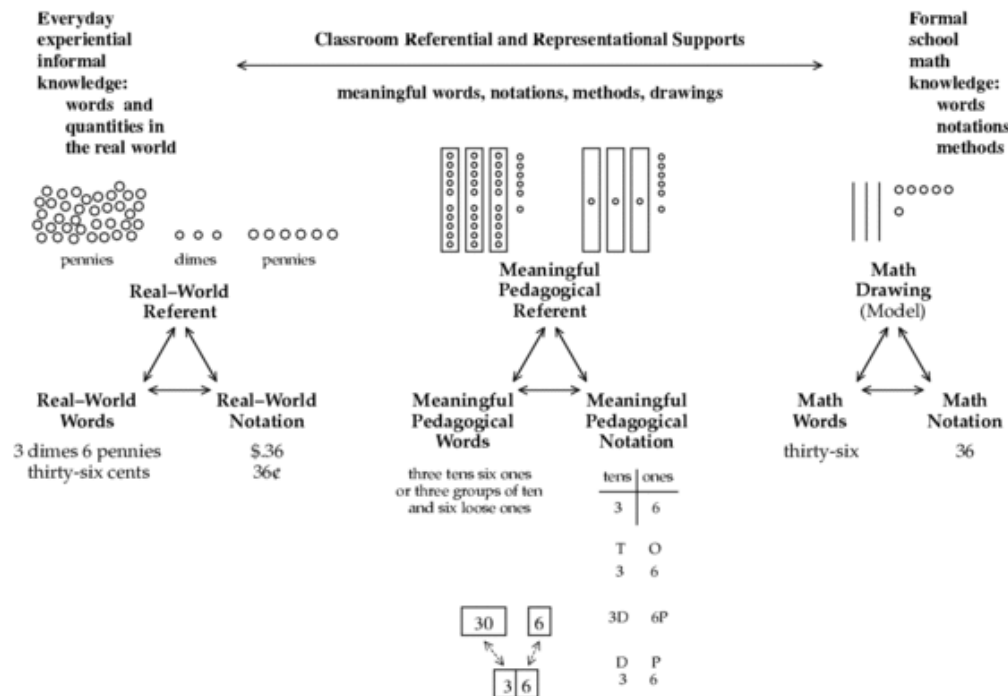
- Introduce students to the concept of the intertwining of science, technology, engineering and mathematics

**Materials**

Copy of the lesson  
Computers with internet access

**Background and discussion**

Mathematics is one of the first things a child learns in life. Toddlers learn how to count and manipulate objects using building blocks, moving on to drawing objects and representing the physical objects with figures (numbers). The ability to represent a physical number of objects, for example three blocks with the number 3, moving from physical representation to an abstract representation is a very important step in human development.



**Figure 1.** Representation of simple data; how meaningful words, notations, methods and drawings can express information, moving from *physical* representation to *abstract* representation of the information.

The figure is from *How Students Learn: History, Mathematics and Science in the Classroom*.

The continued development of these skills prepares humans for further abstraction, creating and manipulating numbers and letters in equations to solve problems. Learning algebra is the

gateway to understanding abstraction used in mathematics, science, engineering and technology; and using algebra in everyday applications.

The fundamental concept of abstract representation, numbers representing physical quantities, and letters representing numbers is the basis for computer programming. While constructing the SENSE IT temperature sensor, algebra is required to manipulate data (numbers) obtained by the sensor and express the data (using numbers and letters) in a readily understood format, temperature. In the first series of lessons, a multimeter is used to collect the data and algebra is used to express the data. In the second series of lessons, algebra is used to program the NXT to display data.

The key is to remain receptive to learning math. A common misperception is that some people have the ability to “do” math, while others “don’t” possess the same ability. This is simply untrue. Math problems are like puzzles to reason through. While some puzzles are more difficult, it is important to learn as many tools to reason through the problem and to ask for assistance when needed.

It is very important to understand, at a basic level, how we reason about math because math surrounds our everyday lives. We might not realize sometimes how much math we use in a day.

### **Procedure**

- 1) Read the Telegraph Newspaper article, “How math makes the world go round”.
- 2) Select three items from the article that you use in your life.
- 3) In addition to the item, list the math associated with the item mentioned in the article and other aspects of math that might not be mentioned.

For example, Oil. We use oil in so many ways, for fuel for cars, trucks, automobiles, boats, trains, etc, oil in the systems of the engines and mechanical parts, the plastics and other pieces of the vehicles, the list goes on. Math is needed for the identification of the oil, as mentioned in the article, but also the extraction (the 2010 Deepwater Horizon oil spill will serve as a reminder), transportation of the oil to refineries involves a huge amount of math with the shipping and mechanical logistics, the refineries, transport of the processed oil from the refineries to distributors, calculating how much fuel a distributor must deliver to the gas stations to keep customers happy, and all the while calculating the price of gasoline per gallon.

You do not have to know the specifics about the industry or the math involved (which equation is used where), just think about what might be needed to deliver the product and how math is involved.

- 4) Pair up (or in small groups, or class discussion) with others in your class who selected the same item. Share and compare your thoughts on how math is used in the item.

### **Assessment (optional)**

1) Consider a lawn.

- How is math used for maintenance (perimeter, seeding, fertilizing, watering, expense)?
- Why is it important to consider these aspects closely and perform calculations instead of for example dumping a small bag of fertilizer in one spot of the lawn?
- How could sensors be used to optimize the maintenance process?
- How is math used in constructing the sensors for lawn maintenance?

a) Brainstorm in a small group and create a list of ways math is involved with all steps mentioned above, and make sure to add additional aspects not listed which may arise in the brainstorming session.

b) Organize your thoughts on a large sheet of paper, or consider using a concept map, or concept mapping software, to help organize the thoughts.

c) Share your concepts with the balance of the class and compare through large group discussion.

2) Scale up the concept of the lawn to a small sod farm.

- How is math used for maintenance (perimeter, seeding, fertilizing, watering, expense, product, price to charge for product, how to get the product to market)?
- Why is it important to consider these aspects closely and perform calculations instead of for example dumping a small bag of fertilizer in one spot of the farm?
- How could sensors be used to optimize the maintenance process?
- How is math used in constructing the sensors for farm maintenance?

a) Brainstorm in a small group and create a list of ways math is involved with all steps mentioned above, and make sure to add additional aspects not listed which may arise in the brainstorming session.

b) Organize your thoughts on a large sheet of paper, or consider using a concept map, or concept mapping software, to help organize the thoughts.

c) Share your concepts with the balance of the class and compare through large group discussion.