Equation Translation

The ability to understanding the meaning of a mathematical equation is important to many areas in science. This lesson is designed to help students be able to translate equations into sentences and to translate sentences into mathematical equations thereby giving meaning to the equations.

Previous Knowledge
Students should be able to add, subtract, multiply and divide for this lesson. Students should also be familiar with order of operation rules.

New Vocabulary
In this lesson certain words will be referred to as “trigger” words. These words are those that will tell the student to perform a function. These words are substituted with symbols like + and = in the mathematical equations.

Objectives
1. Students will be able to identify “trigger” words in a sentence.
2. Students will be able to translate simple mathematical equations into sentences.
3. Students will be able to translate sentences into mathematical equations.

Arizona State Standards
3M-E3. Describe the concepts of variables, expressions, equations and inequalities.
   PO 1. Describe and use variables in a contextual situation.
   PO 3. Translate a written phrase to an algebraic expression and vice versa (words to symbols and symbols to words)(eg. The quotient of x and y)

1SC-E3. Organize and present data gathered from their own experiences, using appropriate mathematical analyses and graphical representations.
   PO 2. Interpret patterns in collected data.

Materials
   Copies of the Equation Translation worksheet
   Chalkboard or overhead

Time 2 hours

Grade Level 6th to 8th grade

Procedure
On the board, write a simple addition problem like 4 + 3 = 7. Ask one of the students in the class to read the problem out loud. As the student reads, write down what he or she is saying word for word. When the student finishes ask how they knew what to say. Help the class understand that math is a language just like English or Spanish. Ideas can be translated from math language into sentences. On the board write the following problems:
Ask the students to translate each of these mathematical equations into a sentence. Have the students work individually for a few minutes then allow them to discuss with a partner. Challenge the students to come up with more than one way to translate the sentence. Allow the students 8-10 minutes to do this. When time is up ask for volunteers to write their sentence on the board. Try to get many different ways of translating each of the equations.

When all the ideas are exhausted have the class help identify which word the minus sign was translated to. Circle the word in the sentence. Repeat this with the other three equations. Also do the same thing with the equal sign. It is best to use five different colors for each of the five basic mathematical operations. Explain to the students the idea of trigger words. Trigger words are words that are going to trigger a mathematical symbol to come into their mind. Either erase the sentences, except the trigger words, or move to another section of the board. Assemble a list of words that will trigger each of the five basic mathematical functions, add, subtract, multiply, divide and equals. Use the words the students have already come up with from their sentences and encourage them to brainstorm more.

Ask students what would happen if they did not use numbers as the items between the symbols. Give them this example.

The number of girls in the class plus the number of boys in the class equals the number of students in the class.

First have the students identify the trigger words in this sentence. Circle these words. Next identify which ideas are affected by these trigger words. Put parentheses around these ideas. Ask the students how the ideas should be translated. They can come up with their own system or use the whole ideas. Let them decide. Use whatever system the students have come up with and write the newly translated mathematical equation.

(The number of girls in the class) plus (the number of boys in the class) equals (the number of students in the class).

Depending on the system the students choose to use there are a few considerations that can be brought up for discussion. Using the whole idea spelled out can get laborious to write out. Abbreviations can be too cryptic and easily confused with other abbreviations. A good system would be somewhere in between these two extremes.

Good example: Girls + Boys = Students
Bad example: A + B = C

Give each of the students a copy of the Equation Translation worksheet. Help student with this by starting the first one with them. Each individual student should start to work on this individually. After 10 minutes, allow the students to consult in small groups. When students have finished the first four questions, bring the class together to
compare answers and answer any questions that may have come up during this trial as a formative evaluation.

The next question on the worksheet asks the student to combine questions 3 and 4 into one equation. Help students to identify what the answers for questions 3 and 4 have in common. This is where the equations are combined. As a challenge, ask the students to take the new equation and translate it back into English.

Allow the students to return to their groups and finish working on the worksheet.

**Evaluation**
Ask the students to turn in their work as the summative evaluation. If further evaluation is needed have the students come up with sentences that can be translated into math and math equations to be translated into English. Combine the best of these sentences into a quiz to be used later. Administer the quiz the following day as a wrap-up activity.

**Extension**
To take this further, copy a page of word problems out of the math textbook. Instruct students to circle the trigger words in each problem. Have them then come up with an equation. This lesson can also be combined with the Creative Calorimetry lesson plan. In this lesson the students are asked to translate the definition of a calorie into a mathematical equation and then use that equation to calculate the number of calories in an item of food. This provides the students with real world application of their new math learning.