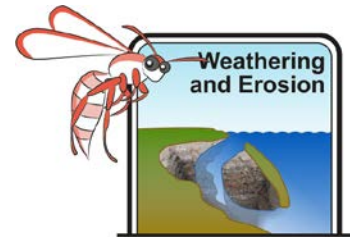


# Evidence of Change – Teacher Notes



## Senses and common sense

These activities are to provide a basic understanding of how scientist collect data and how they conduct experiments.

*Science is just trained and organised common sense.* (J.H. Huxley)

Our survival depends on our senses to tell us if there are changes in our surroundings and then our brain determines whether the change provides an opportunity or a threat and suggests the best response. Scientists observe and measure changes and then try to give the best possible reasons why change occurs.

Name our five senses **Sight, Smell, Touch, Hearing, Taste.**

Which sense do we **NOT** use in Science unless told to by the teacher? Please explain the reason for your answer. **We do not use our sense of taste because many things are poisonous or unclean. We do not wish to become damaged or dead.**

What does a scientist do if they want to smell something? **They gently waft the air above the material towards their nose.**

When a scientist describes anything they have to be careful that everyone will understand exactly what they mean.

Three people saw the same thing and described it.  
“It was huge and frightening and I did not like it”.  
“It was quite small and had poor dress sense”.  
“I found it amusing.”



What do you think they were describing? **Responses will vary**

Why are the descriptions so different? **These descriptions are subjective not objective. They relate only to each persons size, preferences and experience.**



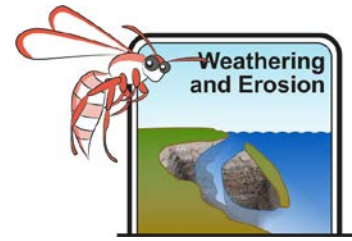
Which of these footprints is big and which is small?

**A is small and B is big**



Which of these footprints is big and which is small?

**A is big and B is small**



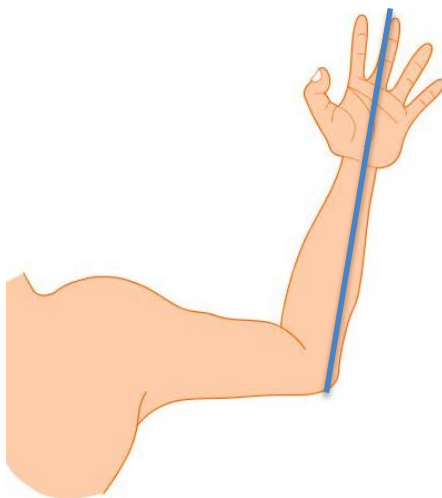
## Evidence of Change – Teacher Notes

How can the same footprint (A) be both big and small? [They only relate to each other.](#)

Do scientist use relative descriptions such as “ bigger” or “hotter” or “nice” in their reports **No**

### Measurement and Standards

In olden times people did not use standard measurements so that measurements could be different in different places. Authorities tried to produce standard lengths to stop disagreement in trade and taking taxes. In many parts of the ancient world the basic measurement of length was one cubit. This is the distance from your middle finger tip to the bottom of your elbow.



One cubit



One digit

To make things more confusing in Egypt the “Royal” cubit was 27 digits whereas earlier in Mesopotamia the Royal cubit was 30 digits!

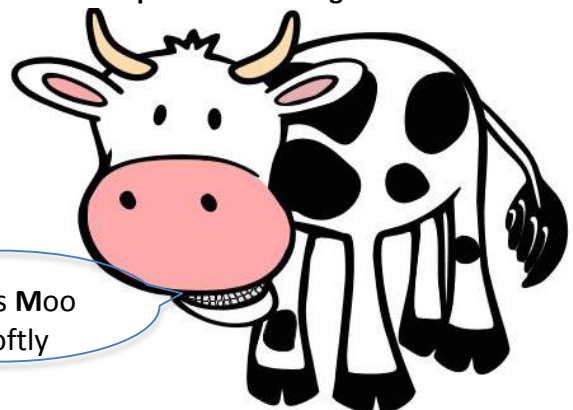
If you had to pay one dollar per cubit to buy cloth in the market, in which country would you get the most cloth for your dollar? [Assuming the measurement of 1 digit was the same in both places, you would get more in Mesopotamia, but the digit units in both countries were not the same size.](#)

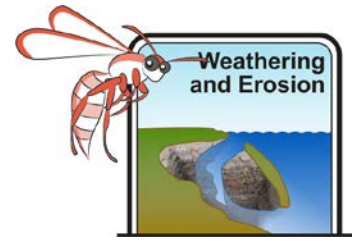
Using the few standard cubit rods uncovered during archaeological digs, the Egyptian cubit was 525mm whereas the Mesopotamian one was 497mm. [So you would get more cloth in Egypt!](#)

### Compare Standard Measurements and Personal Measurements – Experimental Design

TEST the assumption that standard measurements are necessary for science data

This activity is most easily done outside using benches or tables in the yard. Students are asked to observe and measure the length of the table using their own cubits and digits and then repeat using a standard ruler. They then return to the classroom and their measurements are boarded.





## Evidence of Change – Teacher Notes

To make a good science experiment, we must:

- Change one thing**      Arms or ruler for measuring  
**Measure one thing**    The length of the table or bench  
 Discuss/class vote which units would be best  
 Kilometres?  
 Metres?  
 Centimetres?  
 Millimetres?

**S** Everything else stays the same. (Same students, same class, same school, same table, same time, same season etc.)

**Materials** (What would you need?)

- Worksheet and pencil or pen
- 1 ruler per group
- Students
- Calculator

**Method** (What will you do?)

1. Measure the length of the table or bench using a standard ruler
2. Enter this data in the table provided for your observations.
3. Repeat using your arm and finger to measure the table in cubits and digits
4. Add up each column and enter the total figure.
5. Divide the total by the number of readings to find the average for both
6. Copy this into the table provided below

**Observations** (What data did we collect)

Student name	Length in cubits & digits	Length in cm or mm
<b>Total length</b>		
<b>Average length = Total length / Number of students</b>		

**Conclusion** (What did the data above suggest about using relative or non standard measurements compared to standard measurements?) *If you use subjective or non-standard measurements then the results cannot be compared but if you use standard measurements the results are the same/comparable. This is a "Fair Test".*

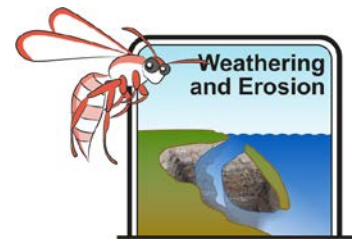
In science experiments we use:

- Rulers                      to measure distance  
 Thermometers            to measure heat and cold  
 Weighing machines      to measure weight or mass

Can you think of any other things we use to measure things in Science?

Answers will vary

## Evidence of Change – Teacher Notes



**Extension** Students can design and carry out their own tests using the CMS model.

Do boys or girls have longer arms? If you have a single sex class this could be changed to brown-eyed people have longer cubits than blue-eyed people