 Hair raising – What is standard deviation?

Adapted from: <http://www.wssd.org/cms/lib02/pa01001072/centricity/domain/132/hair_measuring_activity_for_atmopav.doc>

Your investigation

1. You need to record the length (in cm) of a piece of your hair.
2. Collect the hair length of 10 family members or friends by asking them to phone, text or email you their responses. So, the variable of interest, $x$, is hair length.
3. Calculate the mean (average) hair length for your ‘group’. This is represented as 
4. What is the average distance of hair length away from this mean?

To calculate this:

* 1. subtract the mean from each of the hair lengths (x).
	2. Now add these distances and divide by n (the number of hair lengths recorded).
1. What happened?

A minor adjustment to find meaningful information

1. Find the difference from the mean for each hair length.
2. Square this difference for each hair length (ie multiply by itself eg 10cm x 10cm).
3. Take the average of these **squared** differences.
4. Take the square root of the average of the sum of the squared differences.

Definition

You have just calculated the **standard deviation**. Standard deviation is a measure of how spread out the data is. It says, on average, how far each individual piece of data is from the mean.

Things to think about

1. What conclusion(s) can you arrive at if the standard deviation for the hair length of an entire ‘class’ is zero?
2. One student answered that the class is bald. Are they correct? Are they correct for the right reason? Is having a bald class the only way the standard deviation can be zero?
3. A new girl was added to the class and her hair length was the equal to the average hair length for the class. What impact will this addition have to the standard deviation for the class? To the mean? Don’t answer this one too quickly…
4. If everyone cut 2cm off of their hair, what would happen to the standard deviation for the class? To the mean?
5. If everyone ate a ton of bananas and their hair length doubled, what would happen to the standard deviation for the class? To the mean?
6. In order for the standard deviation to remain the same what type of hair length(s) of student(s) need to be added to the class?

Outcomes

* MA5.3-1WM uses and interprets formal definitions and generalisations when explaining solutions and/or conjectures
* MA5.3-2WM generalises mathematical ideas and techniques to analyse and solve problems efficiently
* MA5.3-3WM uses deductive reasoning in presenting arguments and formal proofs
* MA5.3-18SP uses standard deviation to analyse data