VC Science Session 1 with Warren Bruce at Canterbury University
13 March 2008

This session will be available to view, I will upload it when I get it from Vicki.
I have added the sheets that were given out and a copy of the list you of items needed.

The areas which were online were; South Westland Area School, Greymouth High School, Murchison School , Karamea School , Twisel, Fox Glacier, Akaroa, Buller High and Collingwood.

Warren had set up a bucket, which was sitting on top of a stand and had a funnel in the top, there was a tube coming out of the bucket near the bottom. The bucket was raised so you could collect the water into a container, which was placed under the tube. He pour clear water into the funnel and clear water came out, then he added red liquid (coloured water) and clear came out, then he used blue liquid and clear came out.
The task is based on density, but it will provoke lots of questions and answers about what is happening. *What is happening, the water being poured into the funnel is actually going into a plastic bag, the bucket is full of water to below the tube entry. Hence when you pour coloured water into the funnel, which goes into the plastic bag, the level of the clear water raises and pours out of the tube clear.*

Warren directed us to page 26 in the curriculum aims, where the science focus there is a list on investigations.
page 26 in the curriculum aims there science focus in the new curriculum. list about investigations. You can choose from there what you need to focus on for your students.

*If you do not have a copy of this please let me know I have them all on the training area.*

There is a site where you can download 8, www.sciencepostcards.com. They are inked to a picture book and have resources that go with them, you need to register, this is only for their information, the site is being updated all the time.
The one we looked as was based on the picture book "Cork on the ocean" the science we did around this was on colour mixing, like the traffic light drinks.
*What we did; Warren had a dropper and coloured water, green yellow and red, he took a small amount of the liquid into the dropper of one colour then another. If they mixed you had to start again. The children would predict first would would happen and then through investigation they would find the correct combination. The sheets are available with these resources or on the site.*

The information sheet with the resources, summarises science and asks if we recognise the importance of science (the nature of science). Are we teaching children science will change, it is about looking at bits and the bits become a whole. And how someone else can look at it and see something else, like the dinosaurs some say one thing and others say something else. The Nature of Science is how scientist work and investigate.
Google search 'avoiding de natured science' and you will find the PDF for the full document referenced here.

The resources attached;
*The cubes; children work with them in fours they sit on the table and they have to look at the five faces they can see and work out what is on the face they cannot see, the clues are on the faces they can see.* Reinforcing the Nature of Science; scientist look at data and

look for patterns they discuss it and then when they all agree they will check to see if that is correct.
*You could use pictures or numbers which are common on the cubes to find patterns.*

*The brown picture, which you can imagine is a manila folder, with holes cut out of it; the images you can see through the holes are geometric shapes arranged under the folder, The students need to work out how the shapes are sitting under the manila folder.*
Reinforcing the Nature of Science; This shows the students they can look at the same thing but come up with different answers. Just as Scientist do.

*The sheets with bird tracks on them.*
Reinforcing the Nature of Science; This shows the students they can look at the same thing but come up with different answers. No one is incorrect.

*A toothpick; snap the tooth pick in half and lay it on the table then put a couple of drops of water on the broken part of the tooth pick. Watch, the two halves slowly open up more and more and become nearly straight.*
Reinforcing the Nature of Science; Use the POE sheet, Predict, Observe, Explain (attached), Then are questions like, would it work with an ice block an ice block stick and so on...aim to get kids to ask questions and test them out.

*The cellophane fish; lay it on your hand and observe what happens, it will curl.*
*The paper covered straw; rip off the two ends then start to scrunch it up in the middle like the skin of a caterpillar then put it on the table top then put drops of water in the middle and see what happens, it will slowly expand, this is connect to the fish.*
*The blotting paper; rip of about three centimeters then fold them over and add water to them.*
*Science; capillary , moisture on your hand, differences between the moisture and the air make the things happen.*
*The fish will flatten on a cold surface. Cut the fish out on different angles then they will curl differently.*
Reinforcing the Nature of Science; Raises questions, like what if they used different types of paper what would happen. POE sheets. You could make a water lily out of normal paper and lay it in a bowl of water and see what happens. But not until the students have trialled lots of different things and come back with some conclusions.

Feedback fro participants;

It is great to see a change to a focus on The Nature of Science, for the Secondary Schools, in the Primary Sector.

Linda Holmes - liked the postcards it covers the multilevel classroom well.

We discussed a focus for the next Science Session on 15 May 3:30 - 4:30. Because the Olympics are in Term Three it was suggested this may be a good topic. Warren has a lot of resources around the sports in the Olympics and it was decided he would send these out to participants before hand and he will go through the activities during the session. It was also asked of him if he had any activities based around the materials in their sports clothing, he will look into this.

People also asked about websites;

These two websites referred to by Warren I do not seem to have anything of use for Primary and PreSchool. I will list them below incase you would like to explore them yourself. I will clarify with Vicki I have the correct information on them.

☹ Teachers Association http://www.ppta.org.nz/ ??????

☹ CSTA I found two possibles http://www.cascience.org/csta/csta.asp ????? and http://www.csta.acm.org/ ??????

☺ This one looks great though http://www.abc.net.au/science/surfingscientist/ have a look for yourself.

☺ So did this one, it says to buy, but you can get experiments to see and they also how them as video clips. http://www.stevespanglerscience.com/

There was also mentioned a CD with NCEA assessments on it, I asked if a copy of these could be given to Vicki to distribute the her schools if requested. They are an old resources, but if you dig through them you will find relevant stuff. (these are for secondary schools)

Well hopefully I covered everything.
If I have missed something let me know and I will add it.

I hope everyone enjoyed the session and I hope to see you and some others at the next one.

Bernie

Resources below;

## Introduction: The Nature of Science

The National Science Education Standards (NRC, 1996) and Project 2061 (AAAS, 1989) have again advocated an instructional emphasis on the nature of science (NOS) at K-12 levels. We say 'again' because the goal of helping students develop appropriate understandings of the NOS has been stated as an educational objective for almost half a century. The longevity of this educational objective has been surpassed only by the longevity of students' inability to articulate the meaning of the phrase "nature of science," and to delineate the associated characteristics of science (Lederman, 1992).

The question follows: Are there reasons to believe that the recent reforms will impact students' understandings of the NOS any more than their predecessors? We fear that the current reform documents' emphasis on the NOS will have as little impact as earlier efforts. A two-pronged critical omission that we have noted in previous reform efforts we are, unfortunately, noticing again. There is not, and there has not been, a concerted professional development effort to clearly communicate, first, what is meant by the "NOS" and second, how a functional understanding of this crucial aspect of science can be communicated to K-12 students (Lederman & Mess, 1997).

The first concern clearly relates to the question: "What is the NOS?" The phrase typically has been used to refer to the epistemology of science, science as a way of knowing, or the values and beliefs inherent to the development of scientific knowledge. These characterizations, nevertheless, remain fairly general and philosophers of science, historians of science, and science educators are quick to disagree on a specific definition for the NOS. It is our view, however, that most of the disagreements about the definition or meaning of such a highly prized educational outcome that is so central to science teaching are irrelevant to K-12 instruction. That is, K-12 students will never be, nor should they be, miniature philosophers or historians of science. The disagreements that continue to exist among philosophers, historians, and science educators are far too abstract for K-12 students to understand and far too esoteric to be of immediate consequence to their daily lives. For example, the notion of whether there is an objective reality or only mental constructions is, perhaps, only of importance to the graduate student in philosophy. There is, however, an acceptable level of generality regarding the NOS that is accessible to K-12 students and also relevant to their daily lives. It is at this level of generality that we can see clear connections between students'/citizens' knowledge about science and decisions made regarding scientific claims. It is also at this level of generality that little disagreement exists among historians, philosophers, and science educators.

The characteristics of the scientific enterprise that, in our view, correspond to the aforementioned level of generality and that are emphasized in the present chapter are that scientific knowledge is: a) tentative (subject to change), b) empirically-based (based on and/or derived from observations of the natural world), c) subjective, d) necessarily involves human inference, imagination, and creativity, and e) is socially and culturally embedded.

It is the case all too often, however, that the NOS is conflated with other aspects of science. Science can arguably be defined as having at least three aspects: a) body of knowledge, b) process/method, and c) a way of constructing knowledge about the natural world (i.e., NOS) that distinguishes it from other disciplines or ways of knowing. At times, the distinction among these three aspects is not totally clear, hence the seemingly common confusion between the NOS and science processes (e.g., science is problem solving, science is observing). The knowledge of science has been derived through a myriad of science processes, and the nature of these processes is a direct function of the way science proceeds to construct knowledge, and the status of the knowledge is a direct result of both the processes and epistemological commitments of science. The overlap of the three aspects of science is easily noted, but the three aspects are appreciably different as well. And when we attempt to distinguish science from other academic endeavors (e.g., political science, art, history, religion) it is the NOS (i.e., the values and assumptions inherent to scientific knowledge and its development) that establishes the difference.

As far as communicating proper understandings of the NOS to students is concerned, teachers have been led to believe that their students will come to understand the NOS simply through the performance of scientific inquiry and/or investigations. This advice is no more valid than assuming that students will learn the details of cellular respiration by watching an animal breathe. Far too many students and teachers still believe that scientific knowledge is provable in an absolute sense, objective, and devoid of creativity and human imagination. It is also just as common for students and teachers to believe that laws are theories that have been proven and that there exists a single scientific method which characterizes scientific investigations (Lederman, 1992).

It is our view that developing an understanding of the NOS does not come naturally. It is highly unlikely that students and their teachers will come to understand that science is tentative, empirically-based, partly the product of human imagination and creativity, and is influenced by social and cultural factors through learning about the content of science or its processes. This is not to say that these two aspects are not essential to science teaching. The NOS, nevertheless, is equally crucial and deserves to be equally regarded. We believe that a concerted effort on the part of science educators and teachers to *explicitly* guide learners in their attempts to develop proper understandings of the nature of the scientific enterprise is essential. The notion of explicitness is imperative. It is critical that we target teaching the NOS if the desired impact on learners' conceptions is to be achieved.

The present chapter introduces a set of activities that are designed to model an explicit approach to teaching crucial aspects of the NOS. These activities have been successfully used with students and science teachers. Science educators and science teachers can use the following activities to-, respectively convey to K-12 students and preservice or inservice science teachers adequate notions of the NOS.

# PRIMARY SCIENCE
# ON THE
# WEST COAST

This Kit contains:

- Science Postcard
- A pipette
- Strips of blotting paper
- A cube net
- Cellophane fish
- Toothpicks
- Ice-block sticks
- Kebab sticks
- Paper wrapped straws
- Hole Story sheet
- Tricky Tracks sheets (3x)
- POE sheets (6x)
- Question Starter Stem Sheet
- Nature of Science notes (coloured paper)
- NOS summary sheet

Bring the following:

- Ideas that would be useful to you in future links
- Glass of water
- NZ Curriculum

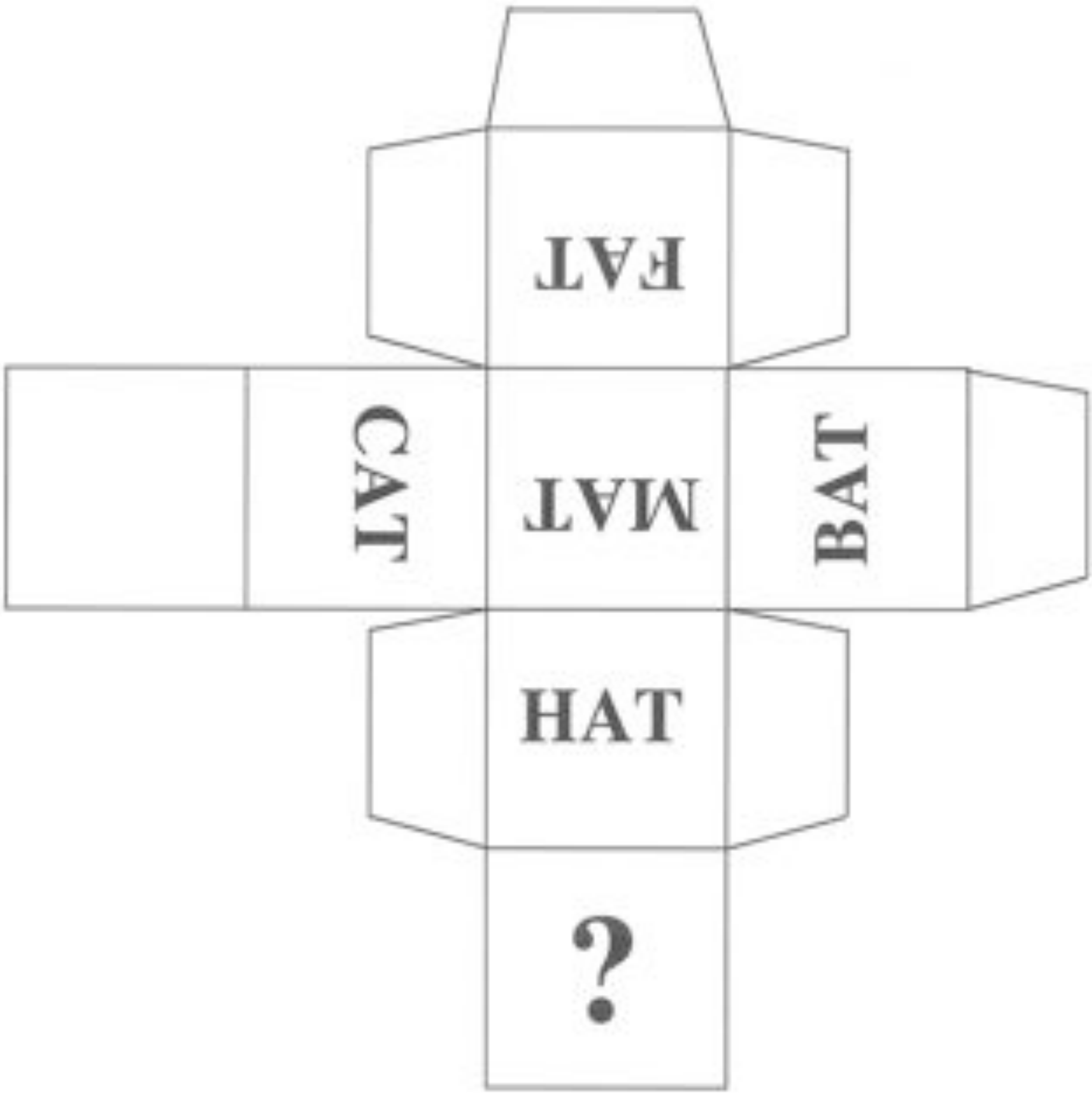
Before the video conference read:

- The Nature of Science notes

What are the key messages this author is saying?

N.B. Explanation notes for all the activities will be sent out on Friday to those schools that take part.

## Tricky tracks 3


FAT
CAT
MAT
BAT
HAT
?

# Tricky tracks 1

## Tricky tracks 2

# Tricky tracks 3

# QUESTION STARTERS

- Why...?
- What would happen if...?
- What affects the...?
- When...?
- Would it be better if...?
- How can we...?
- What...?
- If we changed the..... would the...?
- Do...?
- How...?
- Would it be possible to...?
- What happens when...?
- If...?
- Could we try...?
- How could you make...?
- Where...?
- Does it matter if...?
- How does...?

Warren Bruce - Christchurch College of Education
Box 15 128 Christchurch - New Zealand

# POE

**P = PREDICT**
**O = OBSERVE**
**E = EXPLAIN**

**My prediction is...**

**My partner's prediction is...**

**What I saw happening.**

**Why I think it happened.**

**Questions I would like answered about this activity.**

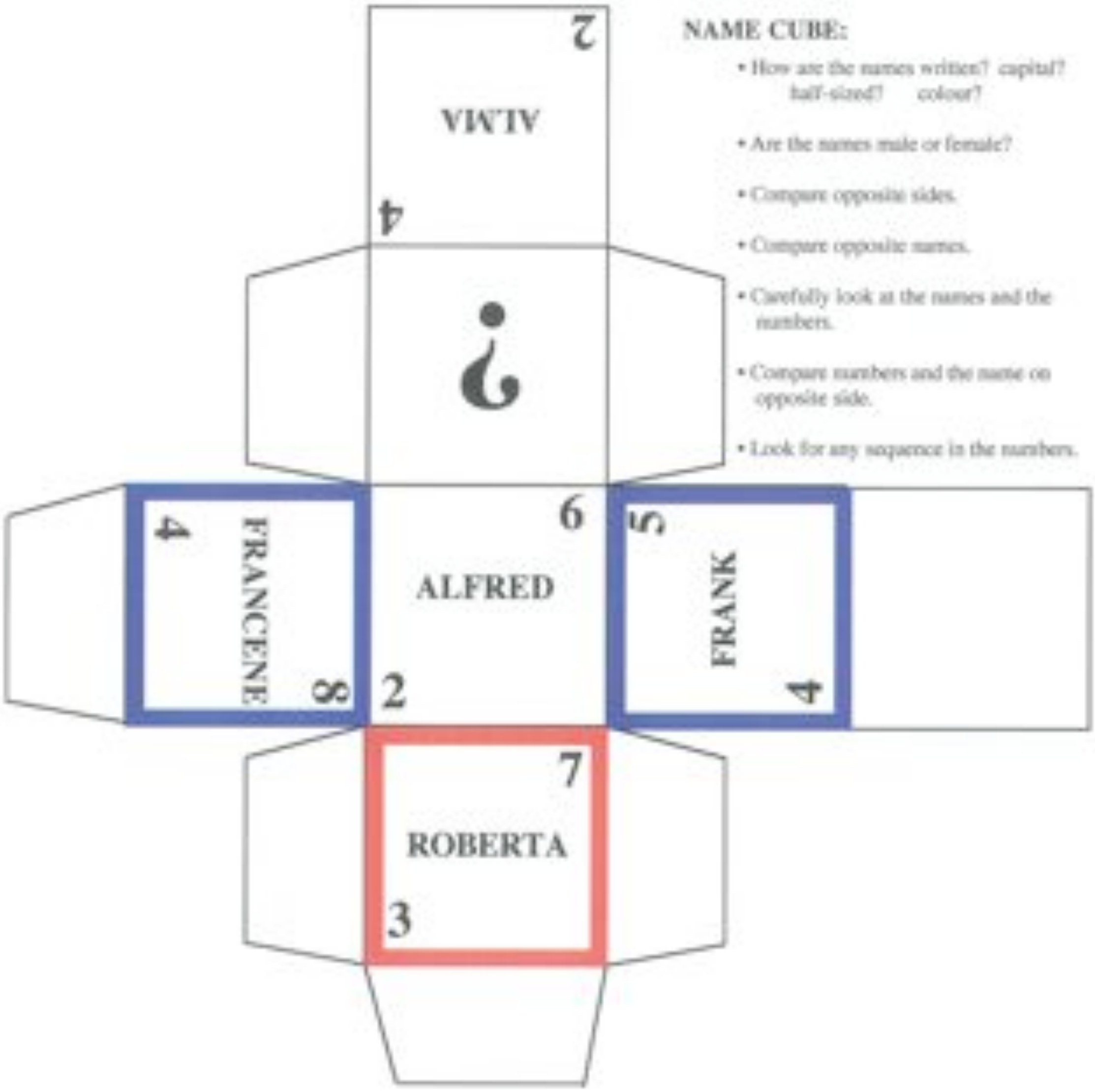
- Would it be possible to...?
- What happens when...?
- How...?

**The question I have selected to investigate is.......**

Warren Bruce - Science Adviser - Christchurch College of Education - Christchurch - New Zealand
warren.bruce@cce.ac.nz

PROMPT SHEET
Looking for Trends and Patterns

Set the children a goal: Find at least three pieces of data that support your proposition. Combining two or more observations creates a strong proposition.

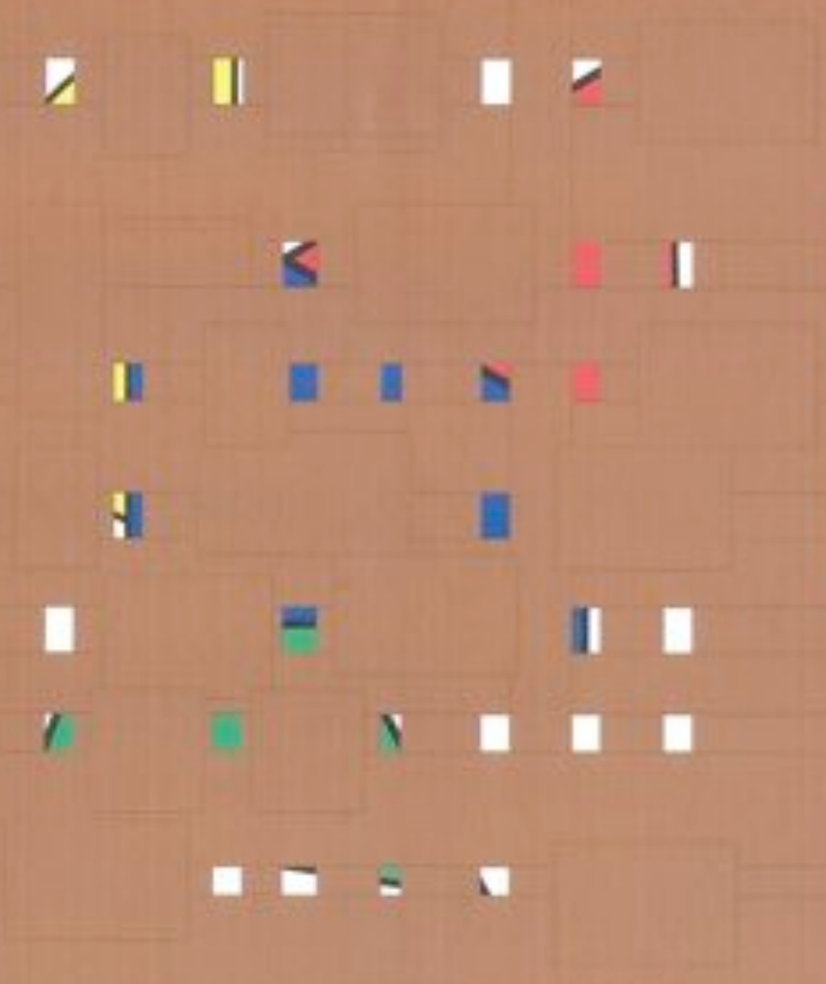



**NAME CUBE:**

- How are the names written? capital? half-sized? colour?
- Are the names male or female?
- Compare opposite sides.
- Compare opposite names.
- Carefully look at the names and the numbers.
- Compare numbers and the name on opposite side.
- Look for any sequence in the numbers.

# THE HOLE PICTURE

Scientific knowledge is partly a product of human inference, imagination, and creativity, even though it is, at least partially, supported by empirical evidence. All scientific knowledge is subject to change (i.e. tentative) as more evidence is accumulated.



THE HOLE PICTURE

THE HOLE PICTURE

THE HOLE PICTURE

# The Nature of Science (NOS)

| Key Competencies | Thinking · Participating and Contributing · Relating to Others · Using Language, symbols and texts · Managing Self | | | |
|---|---|---|---|---|
| | Understanding about Science | Investigating in Science | Communicating in Science | Participating and Contributing |
| Science Exemplar Matrices (Links) | Matrix C<br>Thinking in Scientific ways | Matrix B<br>Investigating in science | Matrix D<br>Developing and communicating Scientific Understanding | Matrix A<br>Developing interest and relating scientific learning to the wider world |
| Achievement Aims | Learn about science as a knowledge system: the features of scientific knowledge and the processes by which it is developed; and learn about the ways in which the work of scientists interacts with society | Carry out science investigations using a variety of approaches: classifying and identifying, pattern seeking, exploring, investigating models, fair testing, making things, or developing systems. | Develop knowledge of the vocabulary, numeric and symbol systems, and conventions of science and use this knowledge to communicate about their own and others' ideas. | Bring a scientific perspective to decisions and actions as appropriate. |
| NZ Curriculum 2007 | L1/2 - Students will appreciate that scientists ask questions about our world that lead to investigations and that open-mindedness is important because there may be more than one explanation.<br>L3/4 - Students will appreciate that science is a way of explaining the world and that science knowledge changes over time.<br>- They will identify ways in which scientists work together and provide evidence to support their ideas. | L1/2 - Students will extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.<br>L3/4 - Students will build on prior experiences, working together to share and examine their own and others' knowledge.<br>- They will ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations. | L1/2 - Students will build their language and develop their understandings of the many ways the natural world can be represented.<br>L3/4 - Students will begin to use a range of scientific symbols, conventions, and vocabulary.<br>- They will engage with a range of texts and begin to question the purposes for which these texts are constructed. | L1/2 - Students will explore and act on issues that link their science learning to their daily living.<br>L3/4 - Students will use their growing science knowledge when considering issues of concern to them.<br>- They will explore various aspects of an issue and make decisions about possible actions. |
| What Research Papers Say | Science is.....<br>- being open-minded<br>- asking questions<br>- making observations<br>- durable and tentative<br>- understanding how science has developed over time<br>- subjective | Science is.....<br>- developing explanations based on evidence<br>- being curious<br>- learning different investigative methods<br>- selecting appropriate investigative method<br>- asking questions<br>- making hypotheses<br>- making predictions | Science is.....<br>- building scientific language through sharing explanations of experiences and observations<br>- using scientific symbols, conventions and vocabulary in explaining a scientific idea<br>- looking for trends and patterns<br>- using simple models | Science is.....<br>- making links with science learning and their daily lives<br>- discussing social/local issues in the community<br>- using scientific knowledge when considering issues of concern<br>- explaining ways of taking effective action |
| Science IS | *Summary produced by Warren Bruce - UC Education Plus - 2008*<br>- Scientists turn their ideas into questions that can be investigated.<br>- Scientists discuss their ideas with others.<br>Scientists' observations are influenced by their science ideas, their communities, and their existing science knowledge.<br>- Scientists design investigations to test their predictions.<br>- When scientists carry out investigations they aim to collect adequate data.<br>Scientists think critically about the results of their investigations and their explanations may involve creative insights.<br>- There may be more than one explanation for the results of an investigation.<br>- Scientific explanations may be in the form of a model. A model is a representation of an idea, object, process or system. Models are often used when phenomena are not directly observable.<br>- Science knowledge is durable and tentative.<br>- Open-mindedness is important to the culture of science.<br>- Open-mindedness is the ability to suspend judgement.<br>- Science interacts with other cultures globally | | | |


I need to re scan this I have missed the yellow square off.