Why science teachers should not be given playground duty.

2017 Lecture 1

Inquiring in Science Classroom 273

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A teacher affects eternity; they can never tell where their influence stops

Henry Brooks Adams (1838 -1918)

What chemicals are in your face products?

Do you know???

http://www.altcancer.net/raiza.htm

Raiza Crème

Code 358 — 2 oz. — $29.98 ■ Availability

●Here are the ingredients in Raiza Creme.

* Vitamin E: This is in all the expensive creams.
* Malpighia glabra: An herb used for depression, rich in vitamin C.
* Aloe vera: contains enzymes, polysaccharides and skin nutrients which exhibit antibacterial and antifungal action. It also has a natural sunscreen effect.

●***Chinese Bovine Placenta:** Many studies confirm use in skin care.

Mad Cow Disease in Cosmetics?

http://www.paulaschoice.com/cosmetic-ingredient-dictionary/definition/mad-cow-disease

Mad Cow Disease (bovine spongiform encephalopathy or BSE) is a chronic degenerative disease affecting the central nervous system of cattle. In people the BSE pathogen can trigger a variant form of the disease called Creutzfeldt-Jakob disease (CJD)

According to the Centers for Disease Control and Prevention(www.cdc.gov) "… in the United Kingdom, the current risk CJD appears to be extremely small, perhaps about 1 case per 10 billion servings [of beef]."

… **the question is whether or not bovine-derived ingredients used in cosmetics can harbor the disease and cause health risks.**

The answer is that no one knows for sure, but theoretically a remote possible risk does exist.

Many decisions we make involve scientific knowledge.

- What diet should I follow? Will the grapefruit diet work?
- What, if any, vitamin supplements should I take?
- Should we vaccinate our children?

http://www.youtube.com/watch?v=RfdZTZQvuCo

REFLECTION & DISCUSSION

- What is science? Do you need science?
- What science do you need to know?
- What do your students need??
- What will you 'need' to teach science?

I for Identity

On the sheet draw, describe, sketch, illustrate to consider

What do you need to teach science?

What is Science?

A way of understanding the world!

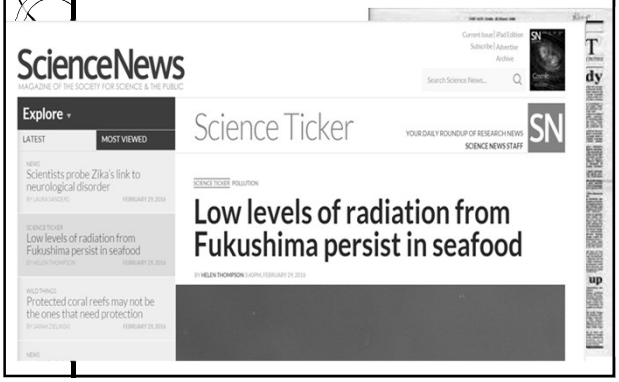
The underlying principle of science is that the world is logical and knowable. It has to be testable.

Scientific research is aimed at extending this understanding and applied science is aimed at using this understanding.

What Makes Science Different?

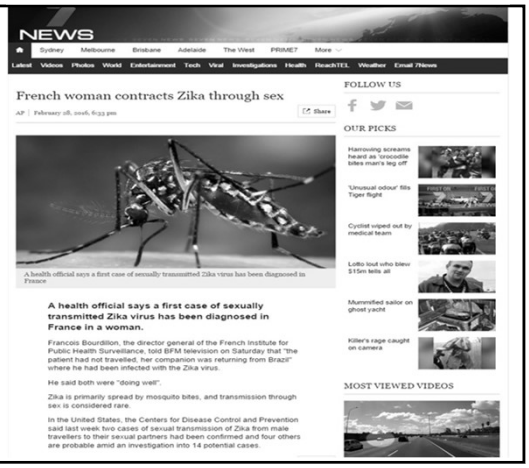
- Science uses several methods to reach an understanding
  - Observation (many situations & scales)
  - Experimentation
  - Logical theoretical reasoning/ inferred
  - Mathematical reasoning
- The findings from each of the methods must support each other before the understanding is considered sound.

Do we need to know science?



Science vs. Creationism

- We need to know the limits of science. Science cannot consider
  - things that cannot be tested
  - philosophical questions like "What is life?", "Is this love?"
  - religious questions like "Is there a god?", "Will I go to heaven?"
  - social questions "Why do people argue?"



Trello

https://trello.com/b/JxN9Oetx/2017-s1-iitsc-sheffield

https://trello.com/b/Ulm8NOhi/2017-iitsc-williams

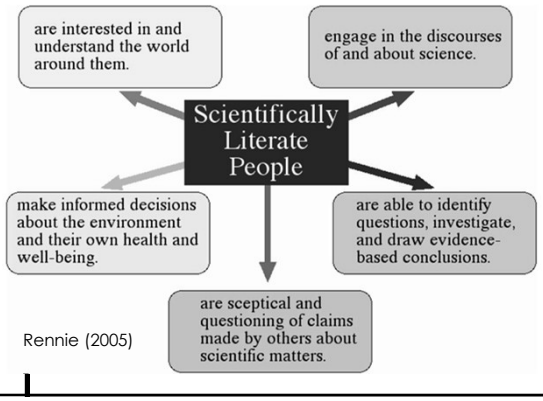
Scientific Literacy

helping citizens

- to be interested in, and understand the world around them,
- to engage in the discourses of and about science,
- to be sceptical and questioning of claims made by others about scientific matters,
- to be able to identify questions, investigate and draw evidence-based conclusions
- to make informed decisions about the environment and their own health and well-being.

(Goodrum, Hackling & Rennie,2001)

Figure 1 A Definition of Scientific Literacy



Rennie (2005)

Blackboard BB

a) *Weekly activity booklet* which includes outcomes, references, questions, worksheets and everything else

b) Weekly Lecture notes in PDF format

c) Assessment. This is all in the file marked assessment

d) Resources. These are a variety of items including on http://www.scoop.it/t/science-sites

And other worksheets, hand outs etc. in resources

Assessment 2

PART	Section	%	In class	Completed
A	Research	5	Week 1	
B	Investigating	10	Week 3	
C	Reporting	10	Week 4	
D	Activities & video	10	Week 4	
E	Reflection	5	Week 5	
	Total	40		

Assignment 2 A child's ideas about a science concept:

Interview a child about their science knowledge with questions you create, record the interview, analyze the responses and then plan 2 activities to advance the child's understanding.
Seek written consent from the parent (use letter & consent form on website) and interview ONE child (Years 3-6, ages 8-12).

Part A Research in Science 5 % (suggested 700-900 words)

Research **ONE** *science* concept from the choice below.
- Electricity
- Heat
- Light (absorbed, reflected and refracted)
- Forces including direct and indirect forces

On the proforma provided write a brief report on your science concept to at least a Year 7 level.
Explain your chosen concept and define the key terms associated with it.
Provide valid labeled and/or annotated diagrams to support your discussion.
Reference your key ideas using *appropriate* academic resources

Science as Inquiry

Stages of Science as Inquiry

Questioning and predicting
Identify problem. Identify variables.
Create research question or hypothesis.

Planning and Conducting
Operationalise variables.
Plan method including pre trials.
Carry out experiment, measure and record.

Processing and analysing
Organise and present data. Analyse data.
Use science knowledge to identify and explain patterns & trends.

Evaluating
Evaluate findings in relation to problem and/or question.
Evaluate design.

Communicating
Communicate findings using scientific language and representations.

Literacies of Science

Scientists use specific forms of language and literacy to learn about, represent and communicate their findings including:

- Data charts and tables
- Graphs
- Diagrams
- Text
- Headings
- Measurements and units of measurement
- Numbers

RESEARCHABLE QUESTION

- What happens to the distance the car travels when it is rolled onto different surfaces?

Variable Grid

What factors might affect how the car will roll?

How are we going to do the investigation?

Things to consider:

- Identify the variables to be controlled i.e. kept the same
- Make it a fair test – decide how the car will be tested in an unbiased way
- State your prediction/hypothesis
- Reach agreement on number of samples and/or repeat trials
- Create a suitable table to record your data.
- Decide on the appropriate type of graph to draw.

Variable Grid

Put the dependent variable in the center of the grid.
Write some factors which might affect
How far the car will run into the other boxes of the grid.

	Distance from point of release	

Variable Grid

Variable	Variable	Independent variable
Variable	Dependent variable	Variable
Variable	Variable	Variable

Question: What happens to _____ when we change _____

INDEPENDENT VARIABLE – Changed ?

(If a variable is deliberately changed in a situation it is called an independent variable)

DEPENDENT VARIABLE

Measured
?

(The variable that may change as a result of the manipulation)

CONTROLLED VARIABLES
?

(Variables that are kept the same)

Hypothesis

- Instead of asking a question to investigate we can state what we believe will happen based on previous knowledge and experience. This is called a hypothesis.
- In this investigation we could state : **The smoother the surface the further the car will roll.**

Question Or Hypothesis

- What happens to

_____
(dependent variable)

when we change

_____**?**
(independent variable)

OR
Hypothesis:

_____

_____

Planning and Conducting your Investigation

- State your question
- Make it a fair test –
- Identify the variables to be controlled i.e. kept the same – how will you do this?
- Decide what you will do
  - Create a method
- Reach agreement on the number of repeat trials
- Create a suitable table to record your data.

Surfaces	Distance traveled (cm)
Carpet	
Cement	
Wooden	
Pathway	

Distance rolled by a car on various surfaces

Independent variable — **Dependent variable & units**

Surfaces	Distance Traveled M1	M2	M3	Average
Carpet	7	8	17	
Wood	22	24	25	
	3	3	2.5	
?	13	14	13	

Title to include IV and DV variables

Graphs

1) What type of graph will you plot? Discuss.
2) Use the proforma and draw an appropriate graph.
3) Describe the shape of the graph and consequently record what you can say about the surfaces and the distance.
4) Can you use your science knowledge to explain your results?

Evaluating

- One way to evaluate an activity is to use a PMI
  - P - Plus or positive aspect of the investigation
  - M - Minus or negative aspects of the investigation
  - I - Comments on Interesting aspects and Improvements or other Ideas about the investigation.
- Use the results of the PMI to say how you could improve the investigation.
- Use your findings to answer your question or determine whether your hypothesis was correct.

COWS MOO SOFTLY

The central feature of most investigations is that you change something and measure the effect it has on something else,

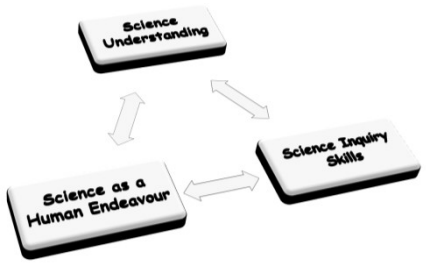
i.e. change the surface and measure the distance traveled

- Cows change something
- Moo measure something
- Softly keep everything else the same

Evidence and Validation

- Any statement made in a scientific context has to be backed up by evidence and validated.
- Can be done using such tools as
  - Observation
  - Question
  - Hypothesise
  - Predict
  - Test prediction
  - Draw a conclusion

National Australian Curriculum



NATIONAL CURRICULUM
Science Understanding

Science as a Human Endeavour
- Nature and development of science
- Use and influence of science

Science Inquiry Skills
- Planning and conducting
- Evaluating

Review

Scientific literacy improves through the investigating process by providing students with an opportunity to:

- have an real and interesting experience of science.
- test out their science ideas.
- plan and conduct an investigation.
- collect, analyse, represent and explain their observations.
- develop investigation skills.