

科學教育學習領域

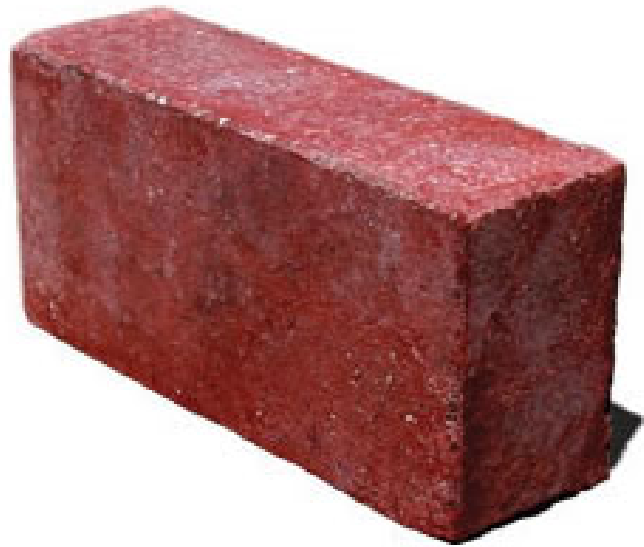
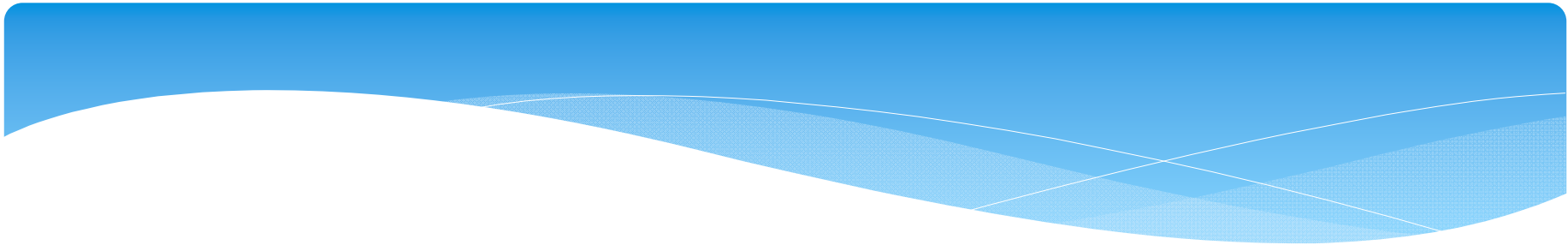
題目：使用英語教授初中科學科 –
老師的反思和分享

日期：2012年11月24日(星期六)

時間：11:15 am - 12:15 pm

地點：香港大學

路德會呂祥光中學
綜合科學科科主任
潘錦麟老師



* Background of students

Class : S.2

Language proficiency: low to moderate

Some students need more support and encouragement in their studies.

Teacher's creative activities are suggested for motivation.

* Prior-knowledge

1. General concepts of scientific investigation and fair test.
2. The 3 variables: Independent variable, dependent variable and control variables.
3. The differences between solute, solvent and solution.
4. Different types of gases in air, the properties of oxygen, what is burning?



優化課業之反思

**Reflection on assignment
improvement**

Development of HW design in I.S.

YEAR	FOCUS
2008-2009	School Based Workbook (Chinese Version)
2009-2010	School Based Scientific Investigation (Chinese Version) e.g. Dissolve candy in water Which type of tissue paper is the best?
2010-2011 Begin MOI class	CUHK QSIP creative worksheet design in Particle Theory
2011-2012 2 nd year of MOI class	Progressive Scientific Investigation Project with Scaffolding in Form 1 MOI class
2012-2013	Media-linked homework with Monitoring and Evaluation

Form 1 A 2011-2012
English Scientific Investigation
REVIEW

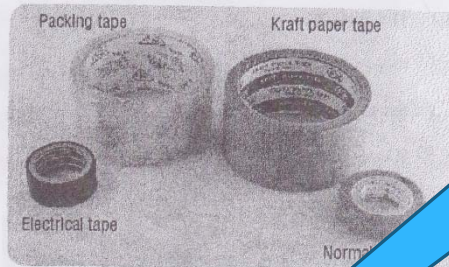
Guided Project

Date: 15th February, 2012

Part II

Which type of sellotape is the best?

Sellotape is commonly used in our daily life. There are many different types of sellotape. Which type of sellotape has the highest stickiness? Let's find out in this investigation.



Purpose

(Why are you carrying out this investigation?)

To find out which sellotape is the best.

Hypothesis

(What is your hypothesis?)

If the sellotape is better, it can stick heavier things.

Variable table

(List out the variables of the investigation in the following table.)

Controlled variables (What you will keep constant)	Independent variable (What you will change)	Dependent variable (What you will measure)
<u>Which tape of surface</u> <u>length of sellotape</u>	<u>Sellotape.</u>	<u>X.Kg.</u> <u>maximum force</u>

What will you keep constant?

What will you change?

What will you measure?

Hints!!

Materials and apparatus

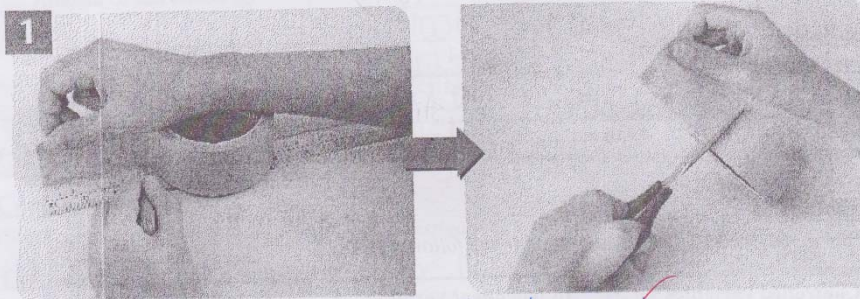
(Put a '✓' in the box to select the materials or apparatus that you will use in this experiment.)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Normal sellotape | <input checked="" type="checkbox"/> Electrical tape |
| <input checked="" type="checkbox"/> Packing tape | <input checked="" type="checkbox"/> Kraft paper tape |
| <input type="checkbox"/> Stapler | <input checked="" type="checkbox"/> Scissors |
| <input checked="" type="checkbox"/> Glass surface | <input checked="" type="checkbox"/> Metal surface |
| <input checked="" type="checkbox"/> Tile surface | <input checked="" type="checkbox"/> Wooden surface |
| <input type="checkbox"/> Piece of paper | <input checked="" type="checkbox"/> Marker |
| <input checked="" type="checkbox"/> Spring balance | <input type="checkbox"/> Electronic balance |
| <input checked="" type="checkbox"/> Binder clip | <input type="checkbox"/> Paper clip |
| <input type="checkbox"/> Rubber band | <input checked="" type="checkbox"/> Ruler |

Procedures

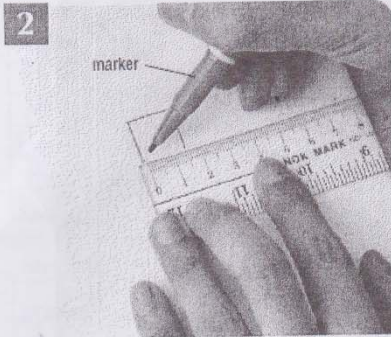
(Write down the procedures of your investigation below.)

(Hint: you may use the following words: **strip, mark, square, stick, press, pull, perpendicular, maximum force**)

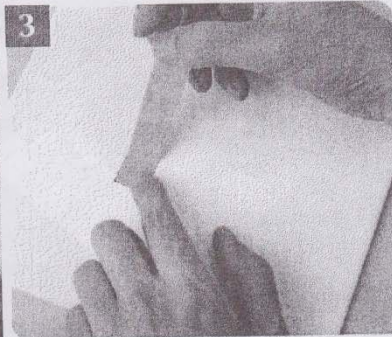


Measure the tape's length and cut it out.

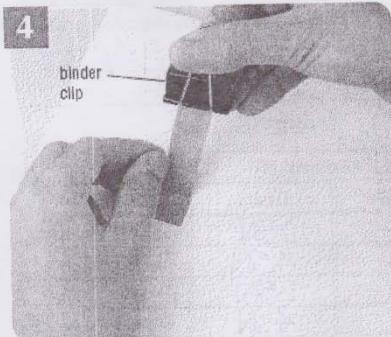
You can use these words:
Strip,
Mark,
Square,
Stick,
Press.....
Maximum force



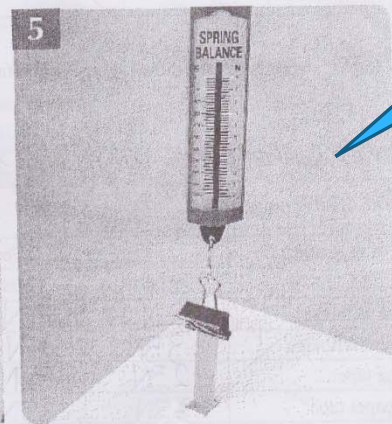
Use a marker to draw a square. *square*



Use the tape to stick the square. *square*

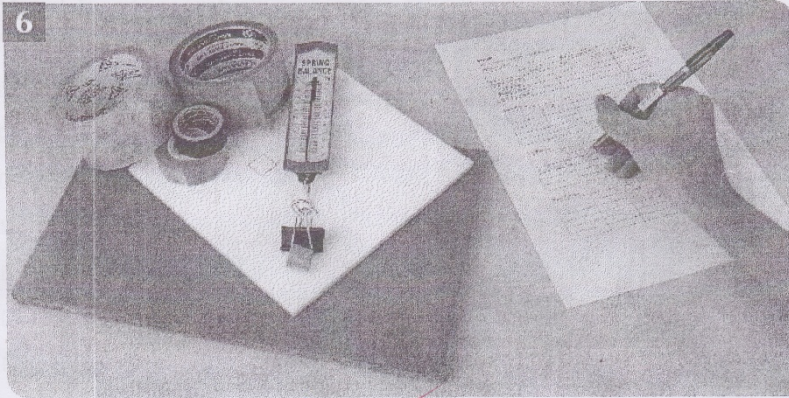


Use a binder clip to clip the tape.



Use a spring balance to measure the *kg* the tape can be. *maximum which*
hold the tile force
with wooden surface.

With photo hints!!



Write down the result.

7 Repeat steps 1 to 6 with different types of surfaces and sellotape.

Results

(Record your results below.)

Wooden surface

Types of sellotape	Force measured (N)			
	Trial 1	Trial 2	Trial 3	Average
Normal sellotape	2N	3N	2.5N	2.5 N
Electrical sellotape	3.5N	4N	4.5N	4 N
Packing tape	2.5N	3 N	2.5N	2.6 N
Kraft paper tape	3.5N	3.5N	4 N	3.6 N

Glass surface

Types of sellotape	Force measured (N)			
	Trial 1	Trial 2	Trial 3	Average
Normal sellotape	3 N	4N	3.5N	3.5N
Electrical sellotape	7.5N	6N	6N	6.5 N
Packing tape	6N	6N	6.N	6N
Kraft paper tape	6.N	5.5N	6N	6.5 N

Pre-set table!

Tile surface

Type of sellotape	Force measured (N)			Average
	Trial 1	Trial 2	Trial 3	
Normal sellotape	3 N	3.5 N	4 N	3.5 N
Electrical sellotape	7.5 N	6 N	6 N	6.5 N
Packing tape	6 N	6 N	6 N	6 N
Kraft paper tape	5 N	6 N	6 N	5.6 N

Metal surface

Type of sellotape	Force measured (N)			Average
	Trial 1	Trial 2	Trial 3	
Normal sellotape	3 N	3.5 N	4 N	3.5 N
Electrical sellotape	7.5 N	6 N	6 N	6.5 N
Packing tape	6 N	6 N	6 N	6 N
Kraft paper tape	5 N	6 N	6 N	5.6 N

Conclusions

(What conclusions can you draw from your investigation?)

The electrical sellotape is the best.



HKU instep

Suggested HW sample

Open Project

Derek Yu 1A (38)

THE WORKSHEET OF THE INTEGRATED SCIENCE CLASS TO ASSESS STUDENTS' UNDERSTANDING OF FAIR TEST (S1) **No hints and photo!**

Task: Investigate factors affecting rate of dissolving

No fixed sample!!

Some solids dissolve fast in liquid. Some dissolve slowly and some even do not. Rate of dissolving actually shows how fast a fixed amount of solid dissolved in a fixed volume of liquid.

There are some factors affecting the rate of dissolving, like temperature of liquid, size of solid, and presence of stirring, etc. Let's do the experiment to find out how these factors affect the rate of dissolving.

Use Fill in the blank and table

After you found out that some substances are soluble in water, choose one of solid for further investigation.

The solid I used is slab sugar ✓

Factor I would like to investigate: the temperature of water ✓

Derek Yu IA (38)

Table of variables:

Variable to be ...

changed (independent variable)

The temperature of water ✓

measured (dependent variable)

The rate of dissolving ✓

kept constant (controlled variables)

The volume of water The size of slab sugar ✓

five

The size of the cup ✓

Material list: (You may take photos of the apparatus to be used and label them in the following spaces provided. Try to use the apparatus and materials found at your home. For example, the spoon, chopsticks and bowl are suitable for use)

Your prediction:

If we add hot water into slab sugar ✓

the slab sugar (name of the solid) will dissolve faster. ✓

Procedures: (Write down your steps one by one in complete sentences.)

(Hint: You have to ensure that the experiment is fair.)

First, we prepare three cups of water which is different in temperature. Then we add slab sugar into the three cups. Finally, we can find out the rate of dissolving. ✓

Student's own photo!

Hot water

a bottle of water

water with 70°C

a box of sugar

sugar (2g)

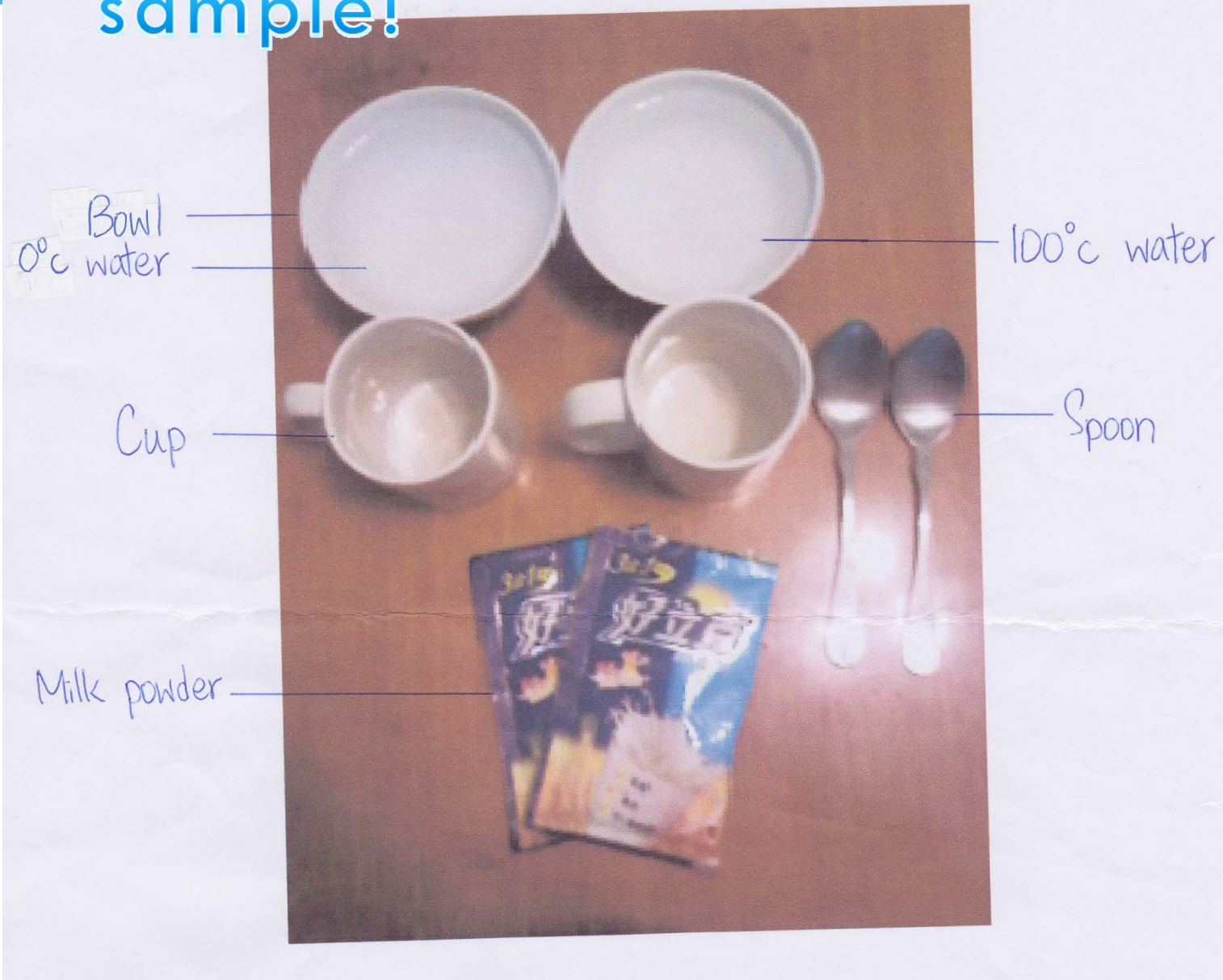
balance

stop watch



2g sugar dissolve in the 70°C water for 1 minute.

Student's own sample!



Student's own sample!



FAIR TEST.

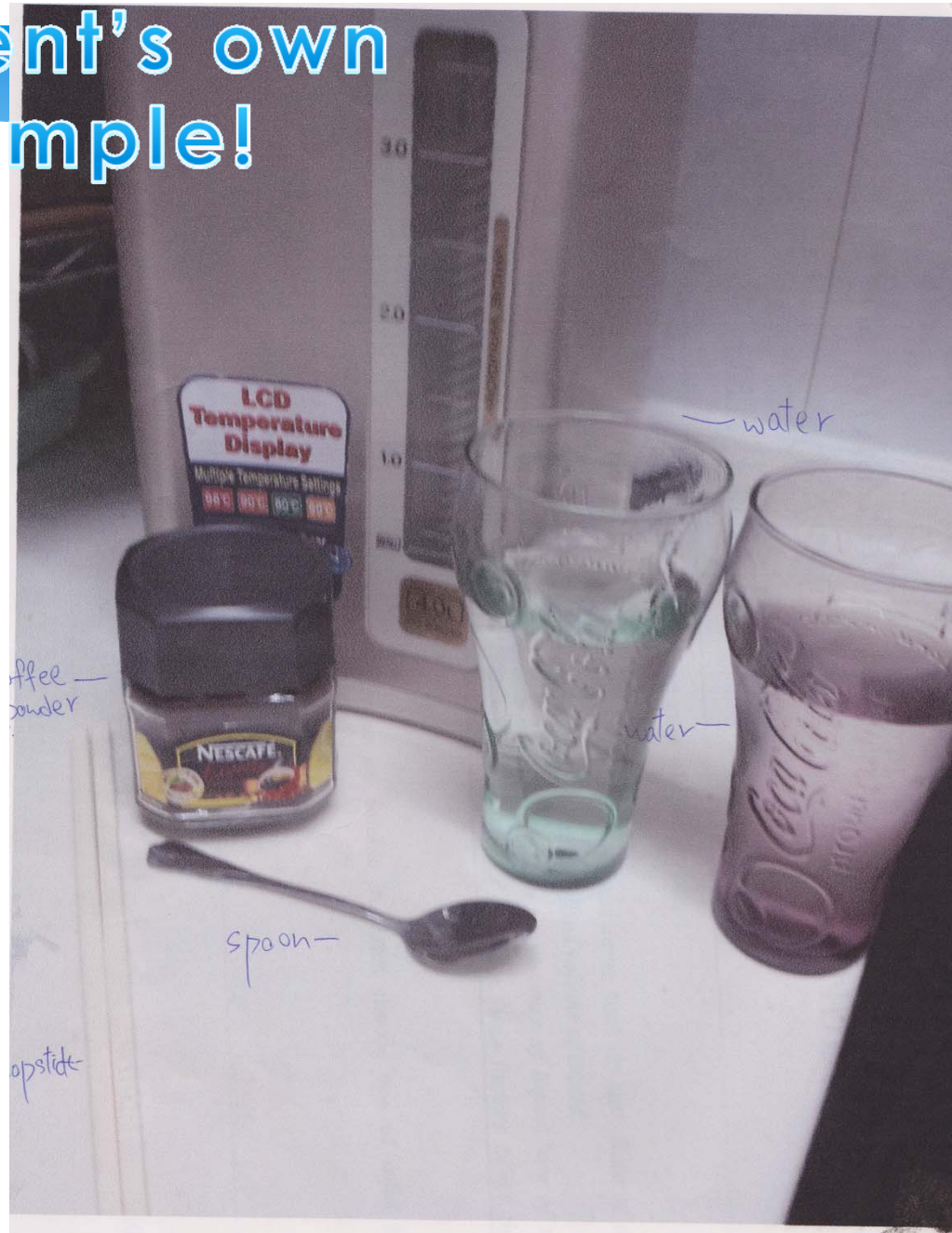
Ashley Cheng Suet Ying



The rate of dissolving in cold and hot water.

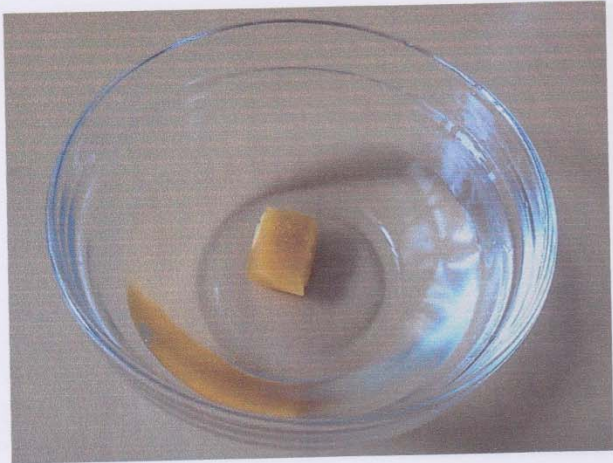
Student's own sample!

Student's own sample!

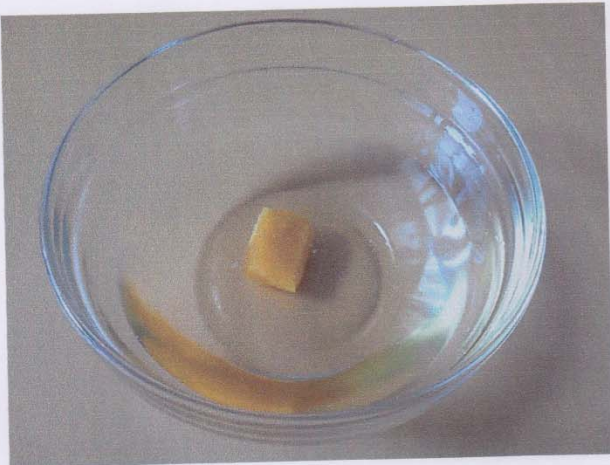


Derek Yu 1A (38)

Cold water

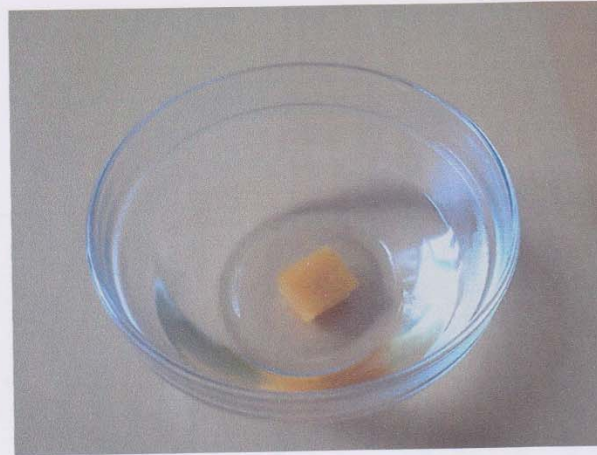


2 mins later



Derek Yu 1A (38)

Hot Water



2 mins later



Evaluations

Students' overall performance

1st Project (Guided)

1. With more mistakes
(Content--- Scientific Investigation)

2. With less mistakes
(English Language)

Learning differences ↓

2nd Project (Open)

1. With less mistakes
(Content---Scientific Investigation)

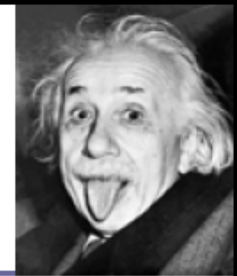
2. With more mistakes
(English Language)

Learning differences ↑

Question: Why?

Traditional Science Homework
cannot improve Student's
proficiency in language of
science????

Difficult words *in* science



abundant	adjacent	contrast
incident	composition	contract
complex	component	converse
spontaneous	emit	exert
relevant	linear	negligible
valid	random	sequence

Cassels & Johnstone (1985)

Logical connectives which cause difficulty



as to	hence	on the basis of
consequently	i.e.	respectively
conversely	in practice	similarly
essentially	moreover	thus
further	nevertheless	whereby

Gardner, P. (1977)

Compare

to represent as similar (liken); to examine the character or qualities of especially in order to discover resemblances or differences; to view in relation to.

相似

Contrast

評價

compare or appraise in respect to differences

Words *of* science



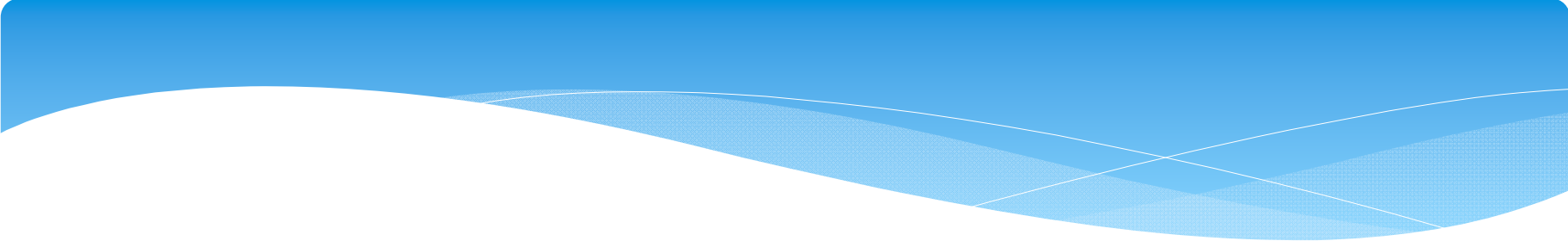
condensation	potential	acid	nucleus
photosynthesis	gene	salt	sperm
sedimentation	matter	force	food chain
ecosystem	pressure	excretion	trachea
respiration	particle	energy	ovary

A taxonomy of the words of science



- Level 1: **Naming** words
 - Familiar objects, new names e.g. **trachea**
 - New objects, new names e.g. **Bunsen burner, beaker**
 - Names of chemical elements
- Level 2: **Process** words
 - Capable of being shown e.g. **combustion, condensation**
 - Not capable of ostensive definition e.g. **evolution**
- Level 3: **Concept** words
 - Derived from experience (sensory concepts) e.g. **red**
 - With dual meanings e.g. **work, energy, power, fruit, salt**
 - Theoretical constructs e.g. **element, mixture, compound, atom**
- Level 4: **Mathematical** 'words' & symbols

明示



Pupils won't have a
chance of understanding
words in the taxonomy
unless careful
attention, and time, is
devoted to language

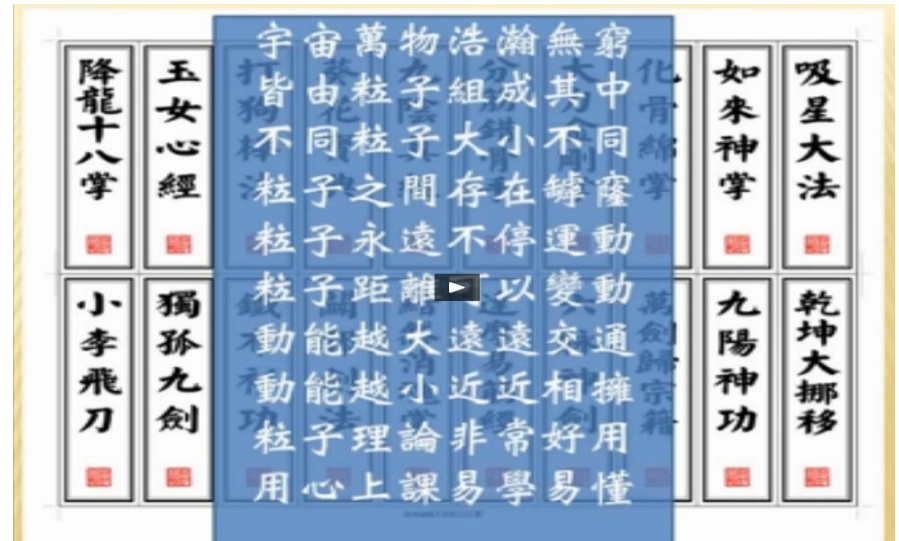


What should we do?




Strategy

Bible of particle theory




1. Learning about ELLs

- language and academic backgrounds
 - Oral, reading & writing proficiencies in English
- Information gathering strategies
 - Talk to English colleagues
 - Find out by yourself ...


Difficult words *in* science 

abundant	adjacent	contrast
incident	composition	contract
complex	component	converse
spontaneous	emit	exert
relevant	linear	negligible
valid	random	sequence

Cassels & Johnstone (1985)

Words *of* science 

condensation	potential	acid	nucleus
photosynthesis	gene	salt	sperm
sedimentation	matter	force	food chain
ecosystem	pressure	excretion	trachea
respiration	particle	energy	ovary

Logical connectives which cause difficulty 

as to	hence	on the basis of
consequently	i.e.	respectively
conversely	in practice	similarly
essentially	moreover	thus
further	nevertheless	whereby

Gardner, P. (1977)



Listen

Speak

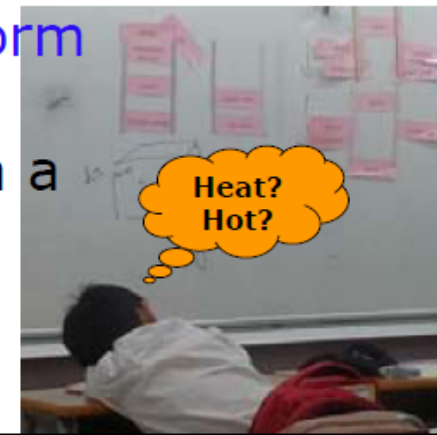
Read

Write

Which one is the most difficult
in your English learning experience?

2. Identifying the language demands inherent in classroom tasks

- Are Ss required to **listen** to a lecture and **take notes** from it?
- Are they being asked to **read** a text and **draw conclusions** from the material read?
- Are those conclusions to be **discussed** with other Ss in small groups or **reported in writing** to the teacher?
- If a written report is required, **what form of text** are Ss expected to produce?
- Must they summarize their thinking in a **paragraph**, or may they do it in **bullet form**?
- ...





Media Education

WS and video

From hku instep

Name: _____ ()

Date: _____

Solution, Solute and Solvent

Task 1 – Listen to a song. Tick (✓) the words when you hear them.

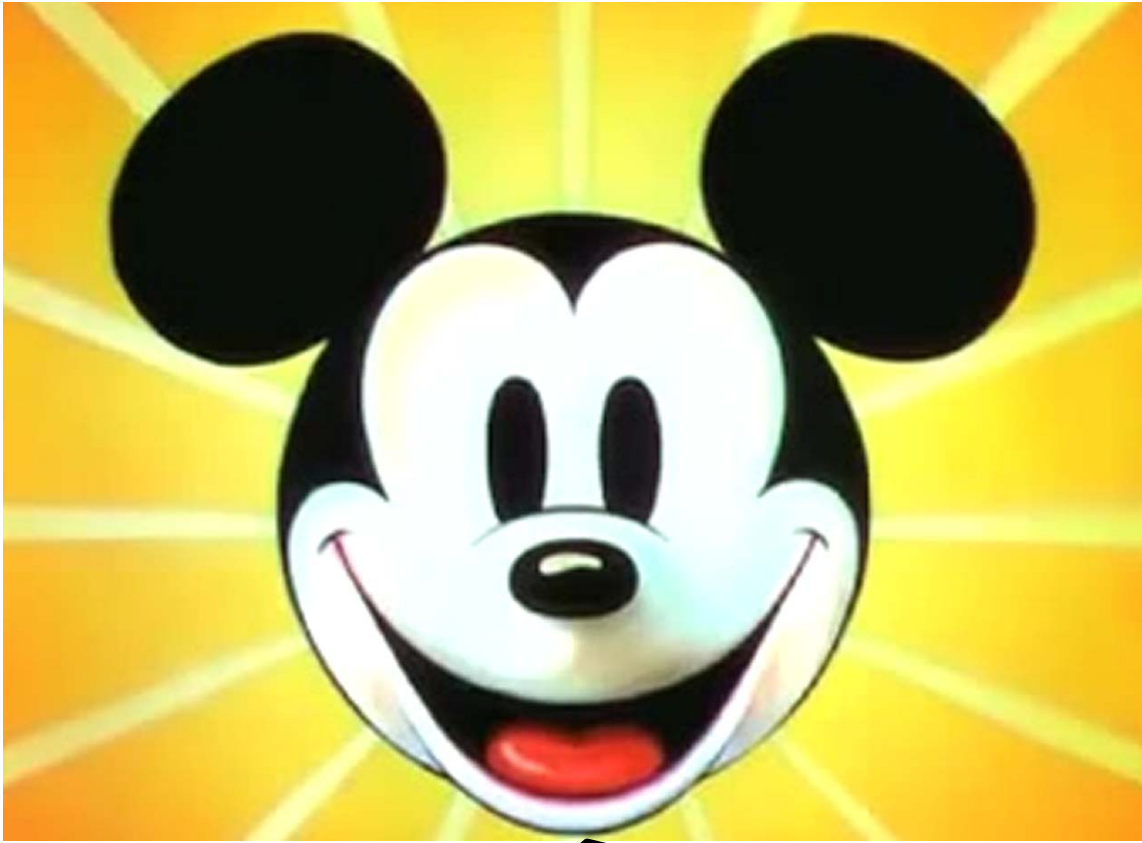
<http://www.youtube.com/watch?v=3G472AA3SEs>

solute		rock sugar		solvent	
chalk powder		dissolve		salt	
solution	✓	mixture		glucose powder	

Task 2 - Look at the words with ticks (✓) in Task 1 again. Can you find them in the word square below? Circle and say them out.

h	d	i	a	s	x	t	v	a
q	i	h	u	o	k	j	s	z
v	s	s	o	l	v	e	n	t
z	s	f	j	u	s	v	k	d
s	o	l	u	t	i	o	n	c
m	l	j	o	e	f	b	x	e
h	v	m	i	x	t	u	r	e
t	e	o	t	p	v	p	n	r

From hku instep



**What we learn from
the cartoon?**

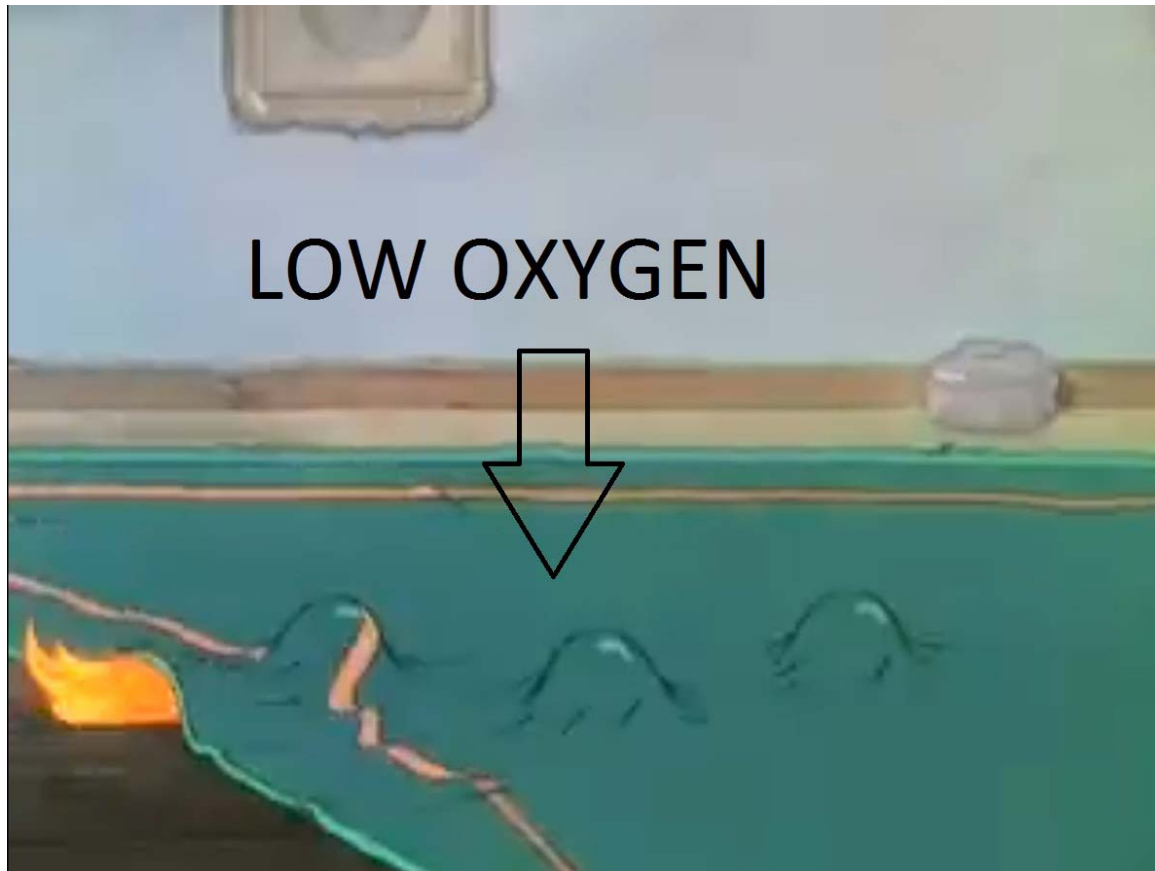


**WATER LOWER
THE
TEMPERATURE**



**HIGH
TEMPERATURE**

MAT LOWER THE OXYGEN SUPPLY



PAPER IS FUEL



The most important support for ELLs

- Language learning is best achieved in an **anxiety-free** environment (Krashen, 1981)
- **Science is difficult to learn** => this adds to the anxiety
- How could an anxiety-free environment be achieved for ELLs to learn science in EMI?



有教無「慮」！！

The most important support for ELLs

- When students **feel unthreatened** and **engaged** in a classroom, their **motivation** is increased, and they are willing to do more **risk-taking**, which positively affects **language learning** (and hence **science learning**)!

SCHOOL BASED

**Media
Education**

WS and video



OUR SMLC (Science Media Learning Centre)

Q & A

