Integrating Content and Language Learning

Conference Materials

By

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ACTIVITY 1 – WRITING EXPLANATIONS – HEAT TRANSFER (Cup Experiment)

1. **Paper cup filled with water:** When a paper cup filled with water _____ over a candle, the paper cup _____. _____ for paper to burn, it must reach a _____ temperature. Paper, **however**, is also a good _____ of heat. The paper in the paper cup _____ the heat to the water, which then _____the heat away. Thus, the paper is _____ to get hot enough to burn.

2. **Styrofoam cup filled with water:** A Styrofoam cup filled with water, **on the other hand**, _____ when placed over a candle. Styrofoam, **unlike** paper, is an _____, meaning it is a _____ conductor of heat. **Thus,** the Styrofoam _____ the heat and the temperature becomes high enough for the Styrofoam to _____.

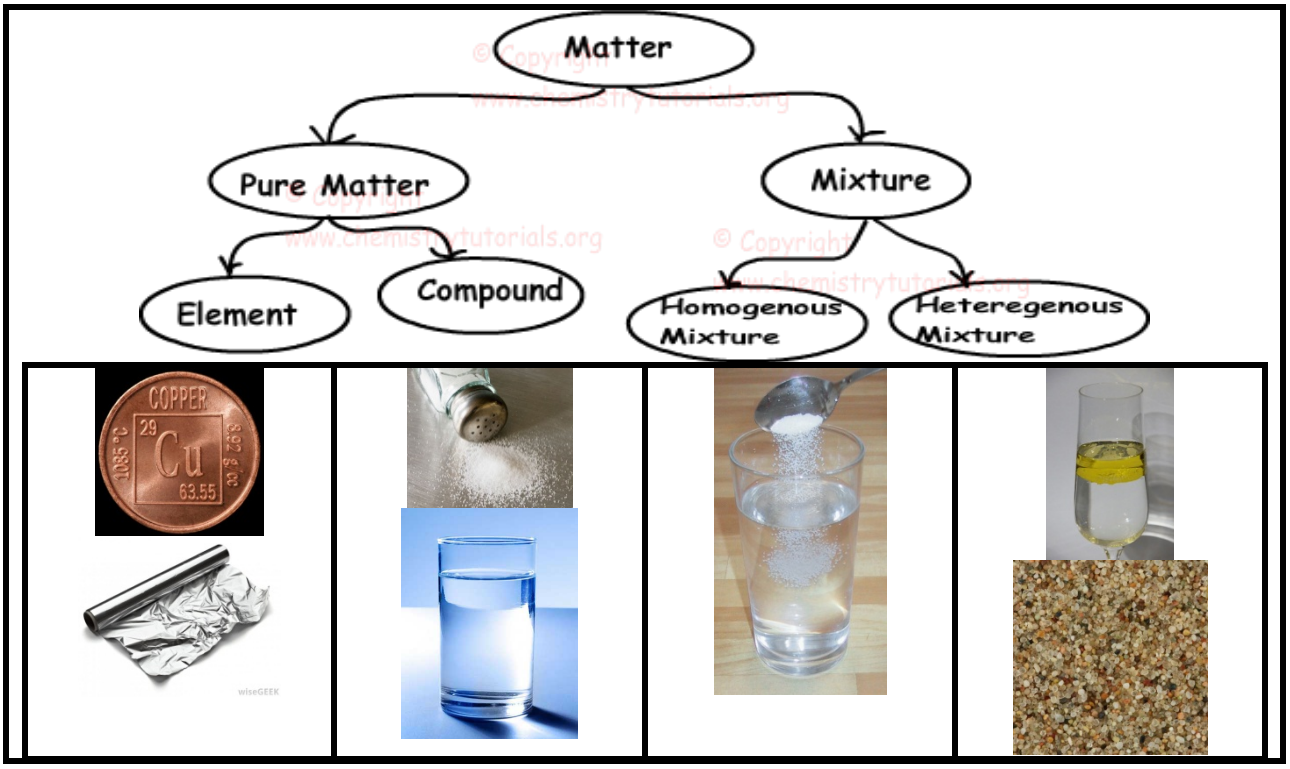
3. **Paper cup filled with sand:** A paper cup _____ however, _____. Although paper _____, sand_____. Unlike the cup with water, the sand is _____ _____the paper. This allows the temperature to _____ _____

4. **Metal cup covered with paper:** A piece of paper _____ _____ _____ _____ _____ _____

ACTIVITY 2 – SORTING MATERIALS

I. Before - Sort the materials

II. After – Example of how Chemists Classify Matter



ACTIVITY 3 – Periodic Web Quest, Information Gap, Alien Periodic Table

A. Periodic Table Web Quest (SAMPE)

Exploration of the Elements

For this activity, you will need to go to the following webpage: http://www.rsc.org/periodic-table. This page has an interactive periodic table. You can explore the periodic table by clicking on the various buttons on the top. If you want to reset your periodic table, click on the button that says 'Clear Filters.'

1. Take a few minutes to explore the periodic table. What do you notice about how it is organized?

2. What do you think the number in the upper left-hand corner represents?

3. Each element is represented by a symbol. For example: He, Cl, etc.
    a. Find three elements whose symbols are very similar to their names (example: He for helium).
        i. Element 1:
        ii. Element 2:
        iii. Element 3:

B: Information Gap

Student A

Element Symbol	Element Name	Atomic Number	Description
H	Hydrogen	1	The lightest element
Se			
Mg	Magnesium	12	It burns with a bright light and used to be used in flash bulbs
	Sulfur		
K	Potassium	19	Bananas are a good source of this.
As			.

Student B

Element Symbol	Element Name	Atomic Number	Description
H			
Se	Selenium	34	Its name means Moon
		12	
S	Sulfur	16	Smells like rotten eggs
			Bananas are a good source of this.
As	Arsenic	33	This element used to be used as a medicine and now is used as a poison.

C – ALIEN PERIODIC TABLE (SAMPLE)

Procedure:

You are a part of a collection of scientists who have been chosen to assist a group of alien scientists. In order to be able to converse scientifically, you must learn their language, and most importantly, you must arrange their elements according to the trends that exist in the periodic table. Below are clues for the alien's elements. So far, the aliens have only discovered elements in groups 1, 2, and 13-18, and periods 1-5. Although the names of the elements are different, they must correspond to our elements if our belief of universal elements holds true. Read each clue carefully, and then place the symbol for that clue's element in the blank periodic table provided.

1. Livium (Lv): This element is responsible for life. It has 2 electron energy levels and 4 electrons available for bonding in the outermost energy level.

2. Computerchipium (Cc): This element is important for its use as a semiconductor in computers.

3. Lightium (L): This is the lightest of elements; aliens previously used it in their aircraft until their aircraft caught fire in a horrific accident.

4. Breathium(Br): When combined with Lightium (L), it makes the alien's most common liquid whose formula is L_2 Br.

ACTIVITY 4 – CLOZE

Matter is made up of tiny _____(1)_____ which are constantly in _____(2)_____. The temperature of an object is dependent upon the _____(3)_____ with which the particles move. Temperature is defined as a measure of the average kinetic energy of the particles in the object. Kinetic energy is the energy due to motion. Particles which are moving fast have lots of kinetic energy and thus, a higher _____(4)_____. Particles which are moving _____(5)_____ have less kinetic energy and thus, a lower temperature. The lowest possible temperature is known as _____(6)_____ zero. The temperature of absolute zero is 0 K or -273^{o}C. At absolute zero, the particles are completely _____(7)_____.

_____(8)_____ is measured using a thermometer. A glass bulb thermometer contains a _____(9)_____– usually alcohol. When the temperature increases, the alcohol expands within the thermometer. The scale on the thermometer gives us a temperature reading. There are two temperature scales commonly used in science : Celsius and Kelvin. The _____(10)____ scale is based on the freezing and boiling points of water, which occur at 0^{o}C and 100^{o}C respectively. The _____(11)____ scale is based on absolute zero.

When two objects with different temperatures come into contact with each other, there is a transfer of _____(12)_____ from the _____(13)_____ object to the cold object. This transfer of energy is known as_____(14)_____ The transfer of energy will continue until the two objects reach the same temperature . These objects are said to be in _____(15)_____ equilibrium.

ACTIVITY 5 – WRITING CONCLUSIONS

Science Lab Report Format (A Descriptive Title) MYP 4-5

Research Question: Clearly stated and answerable. Contains both independent and dependent variables. (B strand 1)

Variables (B strand 3)

- Dependent (measured)
- Independent (experimental)
- Controlled

Hypothesis (B strand 2)

A prediction based on prior observations which you assume to be the explanation for the problem or research question. It should be stated such that the dependent and independent variables are clearly recognizable. IF/THEN hypothesis makes this easier to do.

Background Information (B strand 1/B strand 2)

- An explanation and justification of the hypothesis
- What you know so far from other people's work. Demonstrates that you have looked at other people's work which will provide a deeper insight into the lab. Referencing people's work and ideas increases the validity of what you are saying. (shows you are not just making it up)
- Clear **In Text** with a complete **Works Cited** using **MLA** format. The Works Cited should be on the last page of your report.

Apparatus/ Materials (B strand 3/B strand 4)

- Completely listed materials and special apparatus described.
- Include clearly labeled diagrams ONLY if needed.

Method/Methodology (B strand 3/B strand 4)

- Write a realistic and complete step by step procedure that could be followed by another student. Any procedures coming from another source must be referenced and included in the bibliography.
- Clearly describes how the variables are controlled.
- Allows for the collection of sufficient data.

Data Collection (B strand 3/C strand 1)

- Appropriate raw data collected including units and uncertainties
- Raw data presented clearly (with carefully organized tables)
- Data must be your own data which you have observed, counted or measured BY YOURSELF. Any data from another person or group must be referenced to them.

Data Analysis (C strand 2/C strand 4)

- Raw data processed/ analyzed and completely including error analysis
- Results are presented appropriately and effectively using graphs and tables.
- Errors and uncertainties are taken into account.

Conclusion/ Evaluation

- Make a valid conclusion based on the correct interpretation of data and explained with scientific reasoning.
- Comments on the validity of the hypothesis based on the outcome of the investigation.
- A discussion of the validity and reliability of the method. Is the method sufficient for producing appropriate data and to what extent does the method produce data showing meaningful trends.
- Trends, patters, or relationships in the data are described and the reliability of the data is commented on.
- Suggests modifications of the method based on the evaluation.

Questions for Further Research (C strand 4)

State and discuss further research questions. These must come from your own research and you must explain why they are important or interesting to study

Works Cited

MLA format applied to all sources used in the report. A variety of sources is encouraged.

ACTIVITY 5 – WRITING CONCLUSIONS

Teacher Model of Good Conclusion

Conclusion

The purpose of this investigation was to determine which brand of foil was thicker. **In order to do so,** the length, width, and mass of three different rectangles of each brand of aluminum foil *were measured*. These measurements *were then used*, in addition to the density of aluminum, to calculate the thickness of each piece of foil. **From the calculations, *it can be seen* that** the Red brand of foil has an average thickness of 0.00083 cm, **whereas** the Picnic brand of foil has an average thickness of 0.00098 cm. **One can thus conclude** that the Picnic brand is thicker.

Evaluation

There were several sources of error throughout the experiment. **A systematic error** was that the pieces of foil were wrinkled, meaning that the lengths measured *would all have been* shorter than the true length of the foil. **As a result**, the calculated thicknesses *would all have been* thicker than they really are, **suggesting** that my results are not accurate. **A source of random error** was that the pieces of foil were not perfect rectangles, as *was assumed* in the calculations. **This assumption *would also affect*** the final outcome. **Furthermore**, one of the pieces of foil was torn, which also affected the measurement of the length and width. Since multiple measurements of each length and width were not taken, I cannot comment on the **precision of the data**. The balance and the ruler used in this experiment were sufficiently precise.

In order to improve the experiment, **several steps could be taken**. **To eliminate** the systematic error, the pieces of foil could have been handled more carefully, **to prevent** wrinkling. They could have also been smoothed out to remove any visible wrinkles. **To reduce** the random error, more care could have been taken when making the foil rectangles, **perhaps by** using a paper cutter. The random error **could also have been further reduced** by measuring all four sides of the rectangle, **in order to obtain** a more average representation of the length and the width.

WRITING CONCLUSIONS (continued)

a. Student Activity (Completed using model)

WRITING CONCLUSIONS (completed)

The purpose of this activity is to look at the model conclusion Dr. Manners has written for you and focus on the **organization** and the **language** used. Read through the text. How many paragraphs are there and what is the main idea of each?

Follow the instructions and complete and complete the missing information.

Paragraph 1: Conclusion

This paragraph can be divided into four parts as indicated below. Write out the language that is used for each part.

A.	**The purpose of the experiment:** **The purpose of this investigation was to determine** which brand of foil was thicker.
B.	**Explanation about how the experiment was carried out** **In order to do so**, the length, width, and mass of three different rectangles of each brand of aluminum foil were measured. These measurements were then used, in addition to the density of aluminum, to calculate the thickness of each piece of foil.
C.	**Examination of the calculations and comparison of two results** **From the calculations,** it can be seen that the Red brand of foil has a thickness of 0.00083 cm. **whereas** the Picnic brand of foil has an average thickness of 0.00098 cm.
D.	**Conclusion.** **One can thus conclude that** the Picnic brand is thicker.

Underline the tenses used in this paragraph. Note down examples.

- **PAST PASSIVE VOICE - Were measured; Were then used; It can be seen**

Paragraph II: Evaluation

This paragraph looks at the sources of errors and the results. Complete the table below to show how this is done.

Topic Sentence: **There were several sources of error throughout the experiment.**		
	Error	**Result**
i.	**A systematic error was** that the pieces of foil were wrinkled, meaning that the lengths measured would have been shorter than the true length of foil.	**As a result**, …the calculated thickness would have been thicker than they really are, **suggesting** that my results are not accurate.
ii.	A source of random error was that the pieces of foil were not perfect rectangles, as was assumed in the calculations.	**This assumption would also affect** ….the final outcome.
iii.	**Furthermore, …**one of the pieces of foil was torn,	**which also ….** affected the measurement of the length and width.
iv.	**Since multiple measurements …**of each length and width were not taken,	**I cannot comment on ..** the precision of the data. **The balance and the ruler ….**used in this experiment were sufficiently precise.

What tenses are used in this paragraph? Note down examples.

- Would all have been shorter (3rd conditional)
- Would all have been thicker
- Was assumed

Paragraph III: How to Improve the Experiment

This paragraph looks at how the experiment could have been improved. Complete the table below:

Topic Sentence: In order to…improve the experiment, several steps could be taken.
To eliminate… the systematic error, the pieces of foil could have been handled more carefully ,**to prevent** …wrinkling. **They could also have been** …..smoothed out to remove any visible wrinkles.
To reduce …the random error, more care could have been taken when making the foil rectangles , **perhaps by** …using a paper cutter.
The random error could also have been further by…. measuring all four sides of the rectangle, **In order to obtain**….a more average representation of the length and the width.

What tense is mainly used in this paragraph? Give examples.

- Could be taken (possibility – passive)
- Could have been smoothed
- Could have been further reduced

b. Student Sample based on language learned in above activity

Conclusion

The purpose of this investigation was to determine how water's surface area can affect the length of the time for hot water to be cold. **In order to do this**, the surface area was changed in each experiment by changing the size of the container but using the same volume of hot water at a temperature of 80 ^{0}C. Then when the water cooled to the temperature of 50^{o}C, the time was recorded. **From the calculations, it can be seen** that the bigger the water surface area, the time it takes to cool will get shorter. **One can thus conclude that** the surface area affect the length of time for hot water to cool.

Evaluation

There were several sources of error throughout the experiment. **A systematic error was that** the measurement of the surface area of the containers can't be measured accurately by using a ruler, meaning that the surface area could all have been bigger or smaller, and the final result would have been affected by this. **A source of random error was** that the timer could have been started late meaning the result is shorter, which means final result would be affect by this.
In order to improve this experiment, several steps could be taken. To eliminate the systematic error, the surface area of the water can be measured with a more accurate tool. **To reduce the random error**, the time recorder could be recorded more carefully so that the time record could start more accurately.

ACTIVITY 6 – WRITING ESSAYS

Preparation of students for writing essay (see materials)

STEP 1 - WRITING OUTLINES

- Students write their own outline using the essay title
- Students compare and discuss their outline with model outline (see below)

STEP 2 - UNDERSTANDING MILENNIUM GOALS

- Listening and note-taking

STEP 3 - NOTE TAKING AND SUMMARIZING

- Reading article – note taking and summarizing

STEP 4 - STUDENTS RESEARCH AND NOTE TAKE – AND WRITE ESSAY

- Students research and take notes for the country they have been allocated.
- Students write their essay
- Essays are graded

STEP 5 - REVIEW MODEL ESSAY TAKEN TO DECONSTRUCT

- Students are given a model essay selected by teacher and blank outline
- Using blank outline and essay, students deconstruct the paragraphs
- Discussion with teacher using completed outline on why essay is successful

STEP 1 - ESSAY OUTLINE

One World Assignment – Safe Drinking Water

I. Introduction

Brief description of:

- the region being studied
- the problems which cause unsafe drinking water
- The millennium goals (goal 7c)
- the ways science can help create safe water (name without details)

II. Body

- Causes of the water problems in the region being studied
- Explanation of how the people in the region are being affected by the water problems
- How science is addressing the problems with water in the region (repeat the ways listed in the introduction but give details)
- Make other suggestions about how science could address the problems in the region (see: http://www.drinking-water.org/flas/splash.html)
- Describe how science may affect the social, economic, political, environmental, cultural, or ethical factors of the region chosen
- Consider the limitations of science i.e. that it cannot solve everything for a variety of reasons including: cost, natural resources and practicalities.

III. Conclusion (look back at the introduction)

- Describe again some of the issues which cause unsafe drinking water in the region
- Outline the different ways science can help create safe water
- Provide a concluding sentence

STEP 2 - UNDERSTANDING THE MILENNIUM GOALS

THE MILENNIUM DEVELOPMENT GOAL

Instructions for students:

I. You are going to watch a video clip about the Millennium Development goals. Before you watch read the questions below and see how many of them you can answer.

II. Now watch the video and check your answers. Make sure that the Millennium goals are correct and in the order that they are told.

1. What do you understand by the term **'Globalization'**

2. What **three** things do you think could prevent globalization taking place?

3. What does the UN hope the Millennium Goals will ensure? (The first point is already given).

4.
   a. Peace and Security
   b. _____ _____
   c. _____ _____
   d. _____ _____

5. What is UNICEF is an organization for?
   _____
   _____
   _____

6. List what you think are the **Eight** Millennium Goals.

   I. _____
   II. _____
   III. _____
   IV. _____
   V. _____
   VI. _____
   VII. _____
   VIII. _____

7. What are **two** things that UNICEF wants to make sure every child has?
   1. _____ 2. _____

STEP 3 - NOTE TAKING AND SUMMARIZING (Model shows student's answers)

I. Introduction

Bangladesh and India Water problem:	*Arsenic in the water*
Scientists names who have devised a way to get rid of this problem	• *Abul Hussam* • *Arup K SenGupta* • *Phil Suter*
Success and Economics of this system (cheap or expensive)	*Easy to use, affordable and being distributed to many locations in India and Bangladesh*

II. History – background information

India and Bangladesh main source of water decades ago + cause of problems with this	*Surface water – e.g. ponds, lakes, and rivers; growing populations and bad sanitation meant tainted water*
1970's solution to these problems	*Engineers and aid*

	organizations introduced drilling shallow wells called tube wells (30 and 150 feet into ground) – to access groundwater – been naturally filtered through soil and didn't contain microbes
Problems with groundwater in many areas	Contains inorganic arsenic species called arsenite and arsenates = deadly chemicals
20 years later test results	Show thousands of tube wells pump out water with a lot of arsenic
Effect of arsenic on human health	Not immediate, but over time can cause cancer and death. Hard dark patches on skin appear, followed by nerve

	damage, (hands and legs) liver cancer and kidney failure

III. Solution: Using buckets to make filters

Name of Area in Bangladesh that has arsenic laced water – no. of people living in this region	Kushtia – half a million people
Type of system created by Hussam and colleagues to remove arsenic – and description of system	Filtration system – uses two buckets piled on top of each other. Water poured into the top bucket, passes through special material - composite iron matrix =mixture of iron and iron hydroxide. (CIM)
Chemical explanation of this system In first bucket	A top bucket filled with coarse river sand and a composite iron matrix (CIM). Sand filters coarse particles, while the CIM removes inorganic arsenic.
What happens in second bucket	Water goes to second bucket, layers of sand and charcoal remove

	the solid iron hydroxide particle with their load of arsenic and other chemicals not trapped in the top filter. Wter then collected in a container.

NOTE TAKING AND SUMMARIZING (CONTINUED)

IV. Conclusion

Where testing carried out	With real groundwater in fields of Bangladesh
Success of tests and date when optimized	Very successful and optimized in 2000
Number of filters being produced now Brand name Cost Length of time filter lasts	72,000 SONO $40 Five years
Effect on people's health	People affected with arsenicosis - who been using the filters in last 2 – 4 years seen disease

	reverse and feel better

WRITING YOUR NOTES INTO PARAGRAPHS

Using the notes that you have taken, write up the information into four paragraphs. Make sure that you use your own words.

STEP 5 – MODEL ESSAY DECONSTRUCTION

I. PARAGRAPH I - INTRODUCTION:

A. Topic sentence: _____

B. Supporting Detail:

- _____
- _____
- _____
- _____

C. Thesis Statement: _____

II. PARAGRAPH II - BODY

A. Topic Sentence:

B. Supporting Detail:

i. _____

ii. _____

iii. _____

C. Concluding sentence

_____

III. PARAGRAPH III - BODY

A. Topic Sentence: _____

B. Supporting Detail:

i. _____ - widespread water treatment dating from 10 years ago

- Description
- Analysis

ii. _____ – date when first introduced

- Description

iii. Suggestions of what other types of water treatment should be available in Cambodia

- _____
- _____
- _____
- _____

Examples: _____**+** description

IV. PARAGRAPH IV - BODY

A. Topic sentence – _____

B. Supporting Detail

i. _____

ii. _____
iii. _____
iv. _____
v. _____

V. PARAGRAPH V - BODY

A. Topic sentence – _____
B. Supporting Detail
i. Coagulation – description of limitations – ways to improve effectiveness
ii. _____
iii. _____
iv. _____

VI. PARAGRAPH VI – CONCLUSION

A. **Topic sentence –** Restates importance of safe drinking water
B. Supporting detail
i. Causes of drinking unclean water
- _____
- _____
- _____
- _____

ii. Science can address the water problem despite limitations
- _____
- _____
- _____

iii. Main causes of water problem
- _____
- _____

C. Concluding sentence -
_____
_____
_____
_____

ACTIVITY GRID

Activity	Stage in Unit	Skill Development
1. Cup Experiment	___ Presentation ___ Practice ___ Production	__ Reading __ Writing __ Listening __ Speaking

	___Review	
2. Sorting	___ Presentation ___ Practice ___ Production ___Review	__ Reading __ Writing __ Listening __ Speaking
3. Periodic Table • Web Quest • **Information Gap** • Alien Periodic Table	___ Presentation ___ Practice ___ Production ___Review	__ Reading __ Writing __ Listening __ Speaking
4. Cloze Review (Matter)	___ Presentation ___ Practice ___ Production ___Review	__ Reading __ Writing __ Listening __ Speaking
5. Writing Conclusions	___ Presentation ___ Practice ___ Production ___Review	__ Reading __ Writing __ Listening __ Speaking
6. Essay • Deconstruction Activity	___ Presentation ___ Practice ___ Production ___Review	__ Reading __ Writing __ Listening __ Speaking

SURVEY GIVEN AT END OF COURSE

Note: Use a rating scale of 1 – 5 for the following questions, where 1 is not very good and 5 is very good.

1. How would you rate your ability to:

    - talk about science before the course? 1 2 3 4 5

- write about science before the course? 1 2 3 4 5

2. On a rating of 1 – 5 (1 is not good, 5 is very good), how would you rate your ability to:

   - talk about science at the end of the course? 1 2 3 4 5
   - write about science at the end of the course? 1 2 3 4 5

3. How do you rate yourself in:
   - Writing lab reports 1 2 3 4 5
   - Researching and writing a one world essay 1 2 3 4 5
   - Note taking 1 2 3 4 5
   - Paraphrasing notes in your own words 1 2 3 4 5

4. Which parts of writing a lab report do you feel most comfortable with and which parts do you feel least comfortable with?
   Most comfortable: _____
   Least comfortable: _____

5. Which parts of writing an essay do you feel the most comfortable with and which parts do you feel the least comfortable with?
   Most comfortable: _____
   Least comfortable: _____

6. It was helpful having language support available in the class.
   1 2 3 4 5

7. Because of language support, this course has made me more confident about working on my own outside the classroom.
   1 2 3 4 5

8. Compared to other science courses I would rate this one:

   1 2 3 4 5

9. If the same format of course is available for next year will you sign up for it?
10. Do you think language plays an important role in science? Please explain your answer in the box below
11. Do you have any other feedback/comments about the class which might help us with future planning?