Po Kok Primary School

General Studies

Science Day

Water Filter

P.4 (B)

Name: Matthew

● TASK: You are being selected as one of the scientist to investigate the water filter. You need to find out what ***substances*** inside the water filters can be used to filter the impurities in the water. Design a water filter that can be used to filter the impurities in the water.

Learning Objectives:

- Learn how a water filter works.
- Point out the working principles of the water filter.
- Learn about filtering materials and their functions.
- Learn the factors which affect the effectiveness of the filter.
- Develop scientific way of thinking in students. Apply knowledge learned and think creatively to make a simple water filter.
- Develop students' communication skills, critical thinking skills, problem solving skills and creativity.
- Learn that there are always multiple solutions to a problem.
- Design a product and conduct tests.

Knowledge you have already learned:

1. Properties of water: water has no colour, smell and taste.
2. Water flows and has buoyancy.
3. Purification of water.
4. Uses of water.

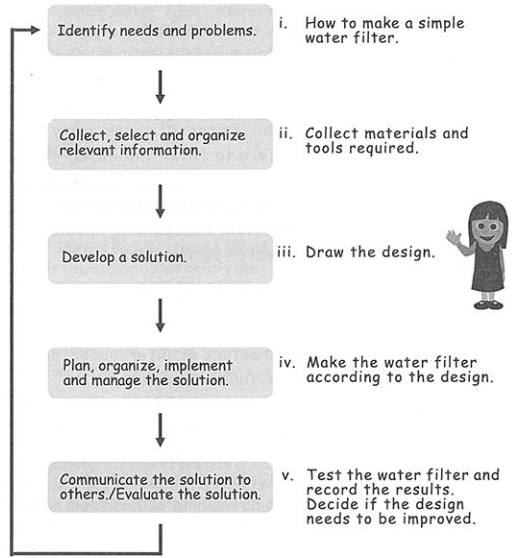
Self Learning Corner

Name of the website	Where to find?
Water Sense Kids, US EPA	http://www.epa.gov/watersense/kids/index.html
The Story of Water Bottle	http://storyofstuff.org/bottledwater/
水分循環	http://ihouse.hkedcity.net/~hm1203/hydrosphere/cycle.htm
Water properties	http://ga.water.usgs.gov/edu/waterproperties.html
Water for a Barren Rock	http://www.info.gov.hk/water150/mbook/ENG/index.html

Learning Procedure for this project

Steps	Learning Procedure	Expectation from you
1.	Learn about water filter	Pay attention in class and take the initiative to learn.
2.	Learn more about water	Pay attention in class. Try some little experiments at home Read more information from website.
3.	Learn about the design of a water filter	Use your creativity and thinking skills.
4.	Think, discuss and come up with your own design	Cooperate with each other, listen and help.
5.	Make a water filter	Participate and discuss.
6.	Presentations	Loud and clear. Be confident.
7.	Experiment with the model	Cooperative with each other. Use your critical thinking skills. Have scientific mind.
8.	Improve your design	Discuss and come up with a better design. Use critical thinking skills.
9.	Evaluations	Honest. Acknowledge your effort and your classmates' effort.

Application of the 'Design Cycle'



Reading 1

Our drinking water has been filtered and purified to meet the international standard. However, some water pipes, old water tanks, etc. may be worn and pollutes the water. Therefore, there may be odors and impurities in tap water. In recent years, many households use water filters to filter tap water.

The most commonly used filtering materials are active carbon, sand and cotton. These materials have different functions for water purification.

Active carbon is a multi-pores substance. It is like a molecular magnet. It has millions of tiny holes, which form an internal structure of interconnected capillary passages smaller than the molecules it adsorbs. Thus, it has an absorptive / reactive function. Molecules from water are attached to the inside surface of the carbon, thus the water is purified. Besides as a filtering material, active carbon can also be used to absorb molecules from gas, e.g. masks.

Cotton and sand can effectively remove suspended dirts in water.

Reading 2

Untreated water from reservoirs undergoes the processes of sedimentation and filtration in water treatment works. Chlorine is then added to disinfect the water. Fluoride is also added to protect our teeth. The treated water is stored in service reservoirs and then supplied to the public. The water in reservoirs contains impurities and bacteria. Therefore, we cannot drink it directly.

Reading 3

The water treatment works in Hong Kong provide us with water of good quality. However, the quality of water may be affected during its journey to our homes. As a result, we are recommended to boil the water from natural sources such as streams should make sure that their drinking water is thoroughly boiled before use.

Reading 4

Sources of Water in Hong Kong

Hong Kong lacks natural freshwater resources. Rainwater and water from Dong Jiang are the two major sources of water.

The Water Treatment Process

Water flows through different places and brings along soil, rubbish, bacteria and other impurities. Therefore, water must be treated before use. The water treatment process in Hong Kong includes sedimentation and filtration which remove dirt and impurities from the water. Chlorine and fluoride are added during the process to disinfect the water and to protect our teeth respectively. However, we should boil the water before drinking.

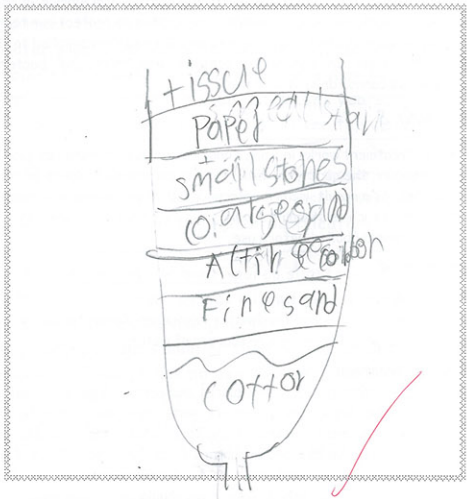
Conserving

Water is important to us. We must conserve water and make sure that not a drop is wasted

(Source: P18-21, Bk 2, Primary 3, New General Studies, Educational Publishing Ltd.)

Activities

1. Design a water filter using the materials provided.



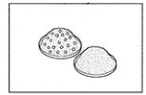
2. Make the filter according to the design.

Now, you are given some materials to make a water filter with simple materials.

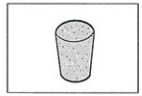
Materials

Cotton

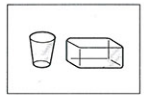
Active carbon



Fine & coarse sand



Impure water



Plastic container

Plastic bottle & scissors

Step 1

Cut the bottom of the plastic bottle to make a funnel.

Step 2

Place some cotton in the funnel as shown.

Step 3

Add the other filtering materials according to this sequence: coarse sand, fine sand, active carbon, fine sand, coarse sand, and finally cotton.

Step 4

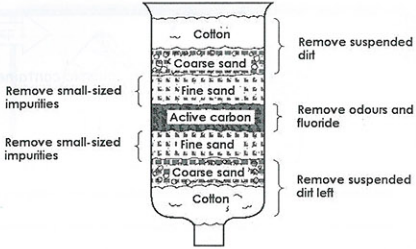
Place the plastic container under the filter.

Step 5

Wash the filter with some clean water.

Step 6

Pour the impure water into the filter. See if the filter works.



Problem solving question

Cotton, ______________________________ , ______________________

______________________ and ______________________________

Introduce your water filter

My water filter's name is Water Fighter. It is made of plastic ~~bottle~~ bottle.

The materials I put into the filter are pine sand, cotton, ~~stone~~, (coarse sand, active carbon).

How do you make a water filter?

LET US THINK!

Explain how you make your water filter:

First, we cut the ~~pto~~ plastic ~~bo~~bottle. Then, we put in the cotton and then the fine ~~carbon~~ active carbon, coarse sand into the filter.

One of the group members holds the filter vertically above a plastic container. Another member pours some impure water into the filter to test if it works well.

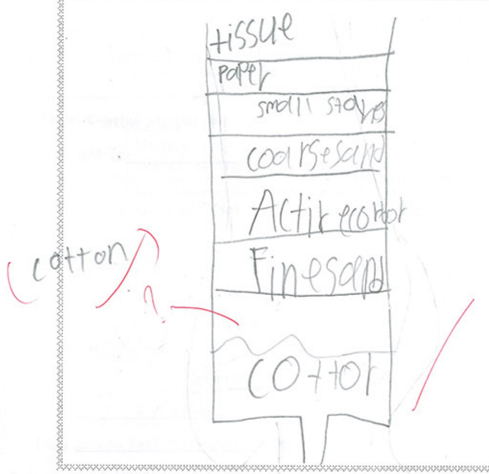
Test results

Tests	After filtering (Please ✓.)				If the filter does not work well, guess why. (may have some discussions first)
	Still unclear	Less unclear	Quite clear	Very clear	
1			✓		Why? ( )
2			✓		
3		✓			Someone put something in it (Who? What's that?)
4			✓		
5				✓	So clean
6					
7					
8					
9					
10					

When making and testing our water filter, we found that:

water can be purified by sedimentation and filtration

Please compare your water filter with your teacher.
Draw the illustrated diagram of the water filter of your teacher.



Which one is better? Yours or your teacher? Why?

Mine, because it is very clean.

Critical thinking zone:

Fill in the blanks.

1. My water filter is (successful / unsuccessful).
2. After filtration, the water becomes ~~dirty~~ clear
3. Which is the best position to pour the impure water?
   ON the top of the filtering materials.
4. The speed of pouring the water into the filter should be slow.
5. Number of times of filtering
   The five (10) times the process is repeated, the clearer is the filtered liquid.

6. What have you learned in this activity?
   ? water filter can help to make the
   ! water cleaner
7. What is the most interesting part of the activity?
   ? Making the water very clean is
   ! fun

Self Assessment

Put a tick in the appropriate boxes.

Scope	Learning Targets	☺	☹
Knowledge	Understand why the water filter works.	✓	
	Learn about the filtering materials.	✓	
	Understand what factors affect the effectiveness of the filter.	✓	
Skills	Use simple materials to make the water filter.	✓	
	Improve the design of the filter	✓	
	Be creative and participate.	✓	
Attitude	Listen and accept others' ideas. Learn to cooperate with others.	✓	
	Record the results seriously and have scientific mind	✓	
	Participate actively and cooperate with others	✓	

How do you feel after doing the experiment?

☐ ☐ ☹ Other:_____

How many stars do you give yourself? Colour.

Peer Assessment

Find two classmates to give you some comment:

Name: Sathideep

Put a tick in the appropriate boxes.

Scope	Learning Targets	☺	☹
Knowledge	Listen and understand how water filter works.		✓
	Understand what factors affecting the effectiveness of the filter.		✓
Skills	Participate in making the water filter.		✓
	Creative.		✓
Attitude	Listen and accept others' ideas.		✓
	Being serious and have a scientific mind.		✓
	Participate actively and cooperative with others.		✓
	Help other students.		✓

Comment: work hard

Name: Megan

Put a tick in the appropriate boxes.

Scope	Learning Targets	☺	☹
Knowledge	Listen and understand how water filter works.	✓	
	Understand the factors affecting the effectiveness of the filter.		✓
Skills	Participate in making the water filter.	✓	
	Creative.		✓
Attitude	Listen and accept others' ideas.		✓
	Being serious and have a scientific mind.		✓
	Participate actively and cooperate with others.	✓	
	Help other students.		✓

Comment: work more harder to learn more

Teacher's Assessment

Teachers may discuss with pupils their performance in the activity, encourage them and give them comments.

Assessment criteria:

Aspects	Details	☺	☹
Knowledge	Know how water filter works.	✓	
	Learn about the filtering materials.		✓
	Know the factors affecting the effectiveness of the filter.		✓
	Mark:	1.5	
Skills	Use simple materials to make the water filter.	✓	
	Test and think about ways to improve the water filter.	✓	
	Improve the design of the filter.	✓	
	Present one's ideas and design.		✓
	Mark:	3	
Attitudes	Accept others' opinions. Learn to cooperate with others.	✓	
	Record the results truthfully.	✓	
	Involved actively in the activity.	✓	
	Mark:	1	
	Total Marks:	5.5	

Comment: Matthew should take part in the activity more actively.

Parents' Assessment

Please tick the appropriate boxes.

Scope	Learning Targets		
Knowledge	Know how water filter works.		
	Learn about the filtering materials.		
	Know the factors that affect the effectiveness of the filter.		
Attitude	Listen and accept others' ideas.		
	Record the results seriously and have a scientific mind.		
	Participate actively and cooperative with others		

Comment:_____

_____

_____

Signature of Parents:_____

Encouragement:

The end.

You have done very well!