# Po Kok Primary School

General Studies

Science Day

Water Filter

P.4( A )

Name: Siddhanta

- 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 |

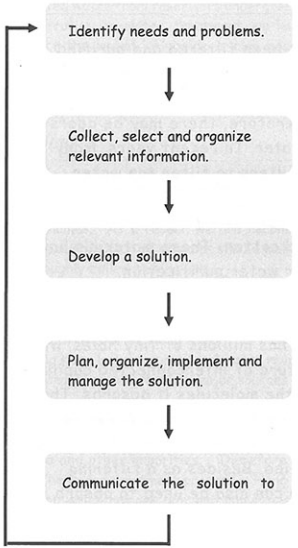
## Learning Procedure for this project

| 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.<br>Try some little experiments at home<br>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.<br>Be confident. |
| 7. | Experiment with the model | Cooperative with each other.<br>Use your critical thinking skills.<br>Have scientific mind. |
| 8. | Improve your design | Discuss and come up with a better design. Use critical thinking skills. |
| 9. | Evaluations | Honest.<br>Acknowledge your effort and your classmates' effort. |





## Application of the 'Design Cycle'




i. How to make a simple

ii. Collect materials and tools required.

iii. Draw the design.

iv. Make the water filter according to the design.

v. Test the water filter and record the results. Decide if the design needs to be improved.

## 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

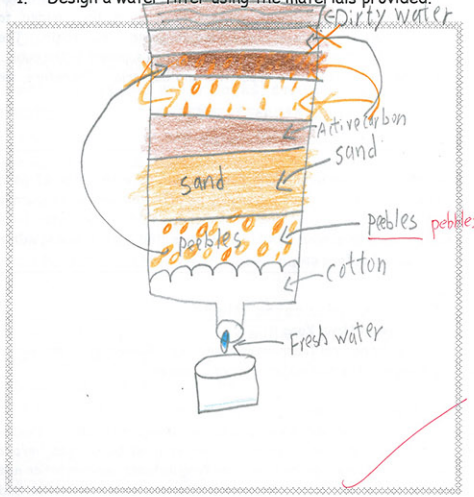
**(Source: P18-21, Bk 2, Primary 3, New General Studies, Educational Publishing Ltd.)**

Class 4A P.6 No 21
Name Siddhanta



***Activities***

1. Design a water filter using the materials provided.



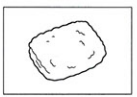




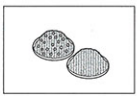

2. Make the filter according to the design.

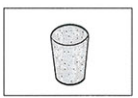
Now, you are given some materials to make a water filter with simple materials.

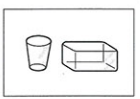
Materials

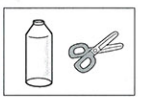

Cotton


Active carbon


Fine & coarse sand


Impure water

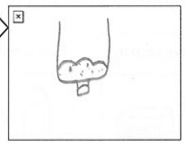

Plastic container


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

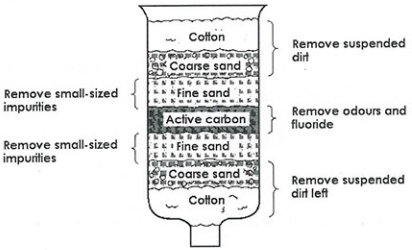
Place the plastic container under the filter.

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, Coarse sand, Fine sand, Active carbon, Fine sand, coarse sand and cotton.





## *Introduce your water filter*

My water filter's name is The best water filter in the world It is made of plastic, ~~cotton, coarse se~~ sand, fine sand, active carbon ~~and~~ the cotton, coarse.

The materials I put into the filter are cotton, coarse sand, fine sand, Active carbon, Fine sand, coarse sand and cotton, ~~coarse~~.

## *How do you make a water filter?*

# LET US THINK!

Explain how you make your water filter:

First, we cut the plastic bottle into halves Then, we put same cotton. After that we put some ~~coarse~~ halves sand ~~and~~ to make up the second layer. Next we put some fine sand. Finally we put some carbon. ~~at last.~~

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 | | | ✓ | | |
| 2 | | | ✓ | | |
| 3 | | | ✓ | | |
| 4 | | | ✓ | | |
| 5 | | | ✓ | | |
| 6 | | | ✓ | | |
| 7 | | | ✓ | | |
| 8 | | | ✓ | | |
| 9 | | | ✓ | | |
| 10 | | | ✓ | | |

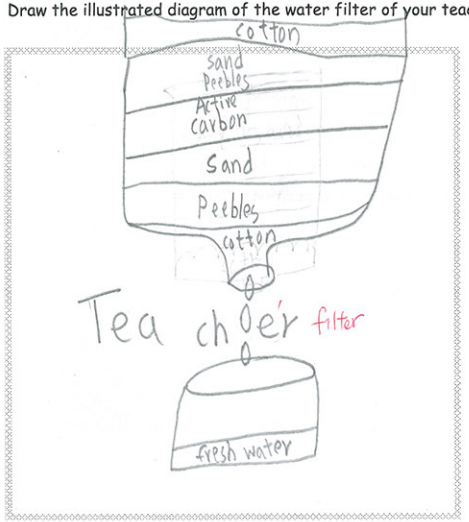
When making and testing our water filter, we found that:

The water was Still a little bit dirty





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?

My Teachers water filter is better my than our's because the layers are equally distirted. distributed

# Critical thinking zone:

***Fill in the blanks.***

1. My water filter is (successful / unsuccessful).
2. After filtration, the water becomes less clear.
3. Which is the best position to pour the impure water?
   Activated carbon From the sand top of the filtering materials.
4. The speed of pouring the water into the filter should be clean water slow.
5. Number of times of filtering
   The ~~1x~~ more times the process is repeated, the clearer is the filtered liquid.

6. What have you learned in this activity?
   About understand why (To understand how) the water filter works.
7. What is the most interesting part of the activity?
   wet pour the dirty water is the (After filtering) becomes water is clear clearer



## *Self Assessment*

Put a tick in the appropriate boxes.

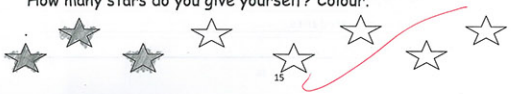
| Scope | Learning Targets | ☺ | ☹ |
|---|---|---|---|
| Knowledge | Understand why the water filter works. | | ✓ |
| | Learn about the filtering materials. | ✓ | |
| | Understand what factors affect the effectiveness of the filter. | ✓ | |
| Skills | Use simple materials to make the water filter. | ✓ | |
| | 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: Virgil 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: _____

Name: Nurna

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: Well done





## 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. | 1 | |
| | Learn about the filtering materials. | 1 | |
| | Know the factors affecting the effectiveness of the filter. | 1 | |
| | Mark: | 3 | |
| Skills | Use simple materials to make the water filter. | 1 | |
| | Test and think about ways to improve the water filter. | 1 | |
| | Improve the design of the filter. | | |
| | Present one's ideas and design. | | |
| | Mark: | 1 | |
| Attitudes | Accept others' opinions. Learn to cooperate with others. | 1 | |
| | Record the results truthfully. | 1 | |
| | Involved actively in the activity. | 1 | |
| | Mark: | 3 | |
| | Total Marks: | 6 | |

Comment: You need to reflect why the water filter in your group didn't work well and improve the design.

## *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: Mayday

Encouragement:

The end.

You have done very well!