Po Kok Primary School

General Studies

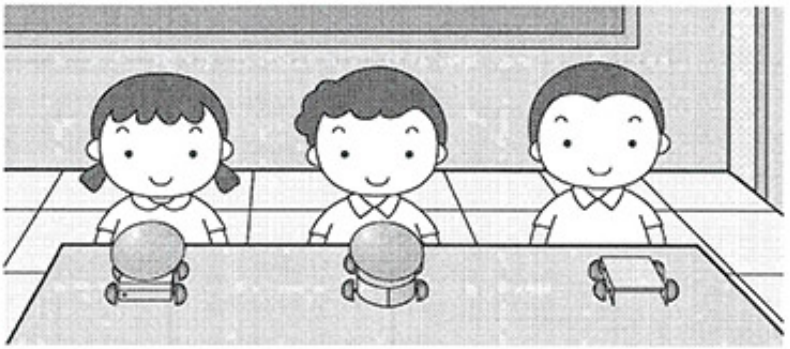
Science Day

An Eco Friendly Toy Car

P.3 (A)

Name: Gamil

TASK: As the top engineer of ECO Car Company, you are going to invent a new eco-friendly car which uses renewable energy instead of gasoline or diesel fuel. Let's get ready for the challenge and conserve the earth together!



Aims

- Learn about the principle of action and reaction forces (Newton's "Third Law of Motion").
- Learn about ways to reduce environmental pollution, like developing and using renewable energy such as solar energy, wind power, etc.
- Apply creativity and knowledge learned to make an eco-friendly toy car.
- Learn that there are always multiple solutions to a problem.

Objective: Make use of simple and recycled materials to design and make a toy car.

Textbook

Primary 3 Book 2,
Unit 3 Transport and Communication,
Chapter 6 Transport Development

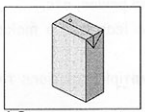
Prior knowledge

- Learn about the history of transport development.
- Learn to pay attention to safety when travelling on vehicles.
- Explain how transport development affects interpersonal interaction.
- Some great inventions of transport.
- Understand how science and technology affect human life.

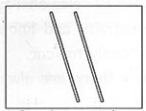
Self Learning Corner:

Check out these videos about Newton's "Third Law of Motion" and its application:

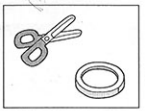
- http://www.youtube.com/watch?v=UVdgxYyFRKY&feature=related
- http://www.youtube.com/watch?v=fKJDpPi-UN0
- http://www.grc.nasa.gov/WWW/K-12/airplane/newton3.html
- http://www.physicsclassroom.com/Class/Newtlaws/U2L4a.cfm



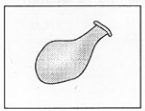
1 Beverage carton



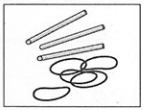
2 Bamboo sticks



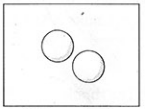
Scissors and adhesive tape



1 Balloon



3 Straws and 5 or 6 rubber bands

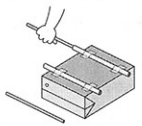


2 Foam balls

Activity Instructions

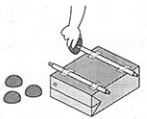
Follow Steps 1-3 to make your eco-friendly car.

Step 1



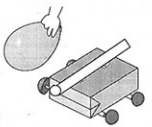
Use tape to fix two straws onto a beverage carton.
Put a bamboo stick into each straw.

Step 2



Cut two foam balls into halves.
Fix them onto the ends of the bamboo sticks.
Use them as wheels for the car.

Step 3



Use tape to fix a straw to the opening of a balloon. Then fix the balloon onto the top of the car. Blow up the balloon. Hold the opening tight. When you are ready, let the balloon go.

Activities

1. Design an eco-friendly toy car using the materials required. Please draw an illustrated diagram in the box.

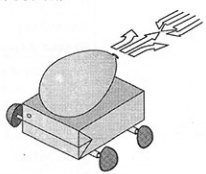
2. Measure distance that the toy car travelled. Divide your group into two teams. One team starts the toy car. The other team marks the stopping position of the car. Improve the design of the car and test again.

Steps	Learning Procedure	Expectation from you
1.	Learn about action and reaction forces – Newton's Third Law	Understand the daily application of the Newton's Third Law.
2.	Learn more about air and how it provides energy for motion	Apply your knowledge by trying some little experiments at home and in the classroom. Read more information from website.
3.	Design an eco-friendly car	Scientifically think of: Where does the motion come from? How can it move faster and go further? Why?
4.	Think, discuss and come up with your own design	Explain your ideas clearly and learn from other to have the best option in the group.
5.	Make a model	Assemble parts carefully according to your design.
6.	Experiment with the model (version 1)	Cooperative with each other. Use your critical thinking skills. Have scientific mind.
7.	Presentation of your findings	Be confident, speak clearly and make eye contact.
8.	Improve your design	Discuss and find out what you can do better in your design? Does the car's shape, weight or the smoothness of the wheels matter?
9.	Experiment with the models (version 2)	Observe carefully, record clearly and think scientifically.
10.	Evaluations	Compare versions 1 and 2. Which one is better? Which one is faster? Which one goes further? Why?
11.	Presentation of your findings	Be confident, speak clearly and make eye contact.

Self - Reading

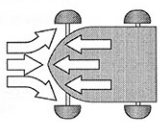
- Scientists in the world have been trying to use renewable energies, such as solar energy, wind energy and hydroelectricity, to make more efficient cars. If people use eco-friendly cars pollution can be reduced.

- In this activity, an inflated balloon is used to propel a toy car. According to Newton's "Third Law of Motion", the principle of "action" and "reaction", every action has an equal and opposite reaction. When the balloon releases the air, it creates an action force. This is a reaction force that pushes the toy car in the opposite direction.



- The forward movement of the toy car is an "action". The opposite "reaction" to this force slows down the toy car.

- If the toy car has a good design, the reaction force of the air in front will be less. With less reaction force, the toy car can then move faster.



- The materials of the car and the design of the wheels affect the speed and travel distance of the toy car. For example, if lighter materials are used, the car can travel faster and for a longer distance. Round wheels with good design are also very important.

- A toy car can be improved to move faster and further by making the opening of the balloon smaller. If the opening of the balloon is smaller, the air inside the balloon will leave more slowly. You can do this by taping one end of a straw and making some small holes on the tape. Then, attach the straw to the opening of the balloon. The holes on the tape should be as small as possible, just large enough to allow some gas to escape.

- A wheel is a kind of simple machine. Wheels, balls and rollers can be used as wheels. The car works moves by using the rolling motion of the wheels. Wheels reduce the friction between the moving object and the ground. They help vehicles move more efficiently.

Sir Isaac Newton, the 'Father of Modern Science'

Application of "Design Cycle"

Ask questions. Acquire new knowledge.

i. How to make an eco-friendly toy car that moves on its own and travels far. Find out what you need to consider.

Think of a design and discuss your ideas.

ii. Think of the best way to make the car after considering the different factors that affect its efficiency.

Find materials to draft your design.

iii. Collect materials and draft your design.

Build your design and test.

iv. Make the toy car according to the design and test it.

Evaluate the solution.

v. Test the toy car and record the results. Decide if the design needs to be improved.

Draw conclusion base on findings.

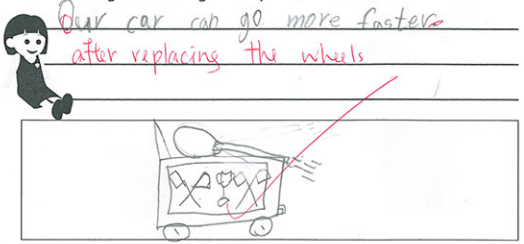
vi. Compare Version 1 & Version 2

After successful tests, you should decorate your toy cars. See which car can travel the furthest and which car has the best design.

Test results

Test	Does the car move in a straight line?	Does the car move fast?	How far did the car travel? (in cm)	Suggested improvement (Write/Discuss)
1	✓	✓	15.0cm	~~replace the wheels~~
2	✓	✓	30.0cm	~~fix the wheels again~~
3				
4				
5				

After making and testing our toy car, we found that



Presentation 1: Introduce your model.

We are group 1.

Our eco-friendly car is made of carton box, three straws, some bamboo sticks, colour papers, one balloon, hard card and tape. It uses the air in the balloon as its motion force.

In the testing of our first version of the car, we found that the wheels did not work well. We are going to improve the first version by replacing the wheels.

Presentation 2: 1. What did you find after experiment 2.
2. Introduce your work.

Our eco-friendly car is made of carton box, three straws, card wheels and one balloon some bamboo stiks, four hard. It uses the air in the balloon as its motion force.

In the testing of our first version of the car, we found that the shape are not hard enough.

Then, we improved the first version by replacing the Wheels.

When we tested the second version, we found that the car can go faster and smoother.

Therefore, the wheels is/are the factors that make the car more efficient.

Critical Thinking Zone

1. If you want your car to move faster, what shape should the wheels be?

If we want our car to move faster, the wheels should be round or circle.

2. What other materials can be used to make the car instead of the beverage carton?

We can use bottle instead.

3. If the opening of the straw is wider, will the car move faster or slower? Why?

The car will move slower because the car will weight more

*4. What do you think the result will be if we use a bigger balloon?

I think the result will be the car will go further and faster if we use a bigger balloon.

Teacher Evaluation

Aspects of evaluation	Details	Performance ✓✓✓	✓✓	✓
Knowledge	Student knows about the principle of action and reaction forces.	✓		
	Student identifies the factors affecting the travel distance of the toy car.	✓		
	Mark:		2	
Skills	Student applies the knowledge learned and uses of simple materials to make an eco-friendly toy car.	✓		
	Student analyzes the problems occurred in testing and thinks about ways to improve the design.	✓		
	Student improved the design of the toy car.	✓		
	Student presents his or her ideas clearly and show his or her creativity.	✓		
	Mark:		4	
Attitudes	Student accepts others' opinions and is able to cooperate with others.	✓		
	Student solves problems effectively during the process.	✓		
	Student records the results accurately.	✓		
	Student gets involved actively in the activity.	✓		
	Mark:		4	
	Total mark:		10 /10	

Self-evaluation sheet

Did you do well in the science project? Circle the appropriate pictures.

1. I ___ the principle of action and reaction forces.


understood


understood some of


did not understand

2. I ___ apply the knowledge learned and make use of simple materials to make an eco-friendly toy car.


could


could sometimes


could not

3. I think my performance was ___.


good


okay


poor

4. I ___ the activity, because it was fun.


like


didn't like

Evaluation sheet (for classmates)

Evaluation items	Performance*		
	Classmate 1: Max	Classmate 2: Kirti	Classmate 3: sukman
Was his / her attitude good?	★★☆	★★☆	★★☆
Did he / she know the task well?	★★☆	★☆☆	★★★
Did he / she present the information well?	★★☆	★★★	★★★
Was he /she involved actively in the activity.	★★★	★☆☆	★★★

*Please colour: 3 ☆ for 'good'; 2 ☆ for 'average'; 1 ☆ for 'poor'

Parents' Evaluation

Evaluation items	Performance		
	Very good	Quite good	Try harder
Was my child's attitude good?	✓		
Did he / she perform the task well?	✓		
Did he / she know about the principle of action and reaction forces?	✓		
Did he / she apply the knowledge learned and used of recycled materials to make an eco-friendly toy car?	✓		

Parent's Comment: Great job

Parents' signature: [signature]

Date: 16/12/2014

Seen