

Blended learning covering science, technology, arts and mathematics for grades K-3.
Connections to Next Generation Science Standards.



School Kit

RECYCLING

- Grow Recycling -

Fun, game-based learning
about STEAM and sustainable
development!



Grow Recycling School Kit

Our natural resources are limited and we need to make sure that we use them wisely. Learning about the different life cycles of the materials that we use every day and thinking about how we can reduce the amount of garbage we are producing is a good starting point. To recycle is a way of using our natural resources in a sustainable way.

In the Grow Recycling School Kit you will find extensive teaching resources including a fun and creative game, curriculum-based lesson plans and teaching guides for classroom activities, fact sheets for teachers, student activity sheets as well as a quiz walk. You may use the material either for a longer project about recycling, or you can just pick and choose individual activities.

• The Game Grow Recycling

Grow Recycling is a game in which students learn in a playful and intuitive way about how the recycling chain is interconnected, and how garbage sorting works.

Meet all the funny recycling containers and feed them with garbage. Who likes what? The containers' reactions help students to figure out each character's favorite waste.

The students then get to come along and make new things from the recycling they

Meet me - Banja-
and my friends in
Grow Recycling and
play and learn about
recycling!



have sorted by following the container into the recycling factory. Here they can play on recycling machines, pull levers, click buttons, spin wheels and play along to the music. Once they have finished playing, they have created a new product from the material they recycled. The product is then used at Banja the bunny's picnic with her friends. Whatever they consume - be it a bottle of juice, a jar of jam or a tin of pineapple rings - it will be taken care of and later ends up in the cycle again.



• About Grow Play Education

Grow Play Education offers school packages for students in grades K-3 in science, technology and mathematics - all with a sustainability perspective. School Kits include lesson plans, student assignments and digital games in areas such as recycling, upcycling, ecological cultivation, renewable resources and biodiversity.

Grow Play School Kits are free and available at Groplay.com/Education.

A free web-based version of Grow Recycling is available on www.groplay.com/web-games/recycling/ and for downloading the game on tablets and phones go to [Apple App Store](#) or [Google Play](#).

• Connections to the Next Generation Science Standards

Science and Engineering Practices:

Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information.
- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)

Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

LESSON 1

TALK ABOUT RECYCLING

Talk About Recycling

• Introduce the Topic

Recycling is everywhere around us today. But what do the students know about recycling if you dig a little deeper into the question? Start by playing Grow Recycling and make a mind map to discover what your students already know and what

they would like to know more about. Start by letting students play the Grow Recycling game as an inspiring start and common ground for classroom discussions.



• Questions to Discuss

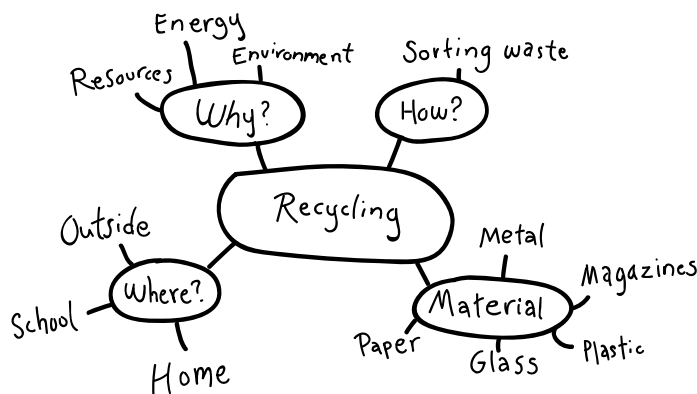
- What do you think the game Grow Recycling is about?
- The game does not have an ending. Instead, it goes back to the start again, like a circle. Why do you think it works like that?
- Why do you think we recycle things?
- Where does the waste come from in the game? How do we produce waste in our daily lives?
- In the game, different types of waste are placed in different containers and the containers have different shapes and colors. What do the containers look like where you live?
- Do you think everything can be recycled?

LESSON 1

TALK ABOUT RECYCLING

• Make a Mind Map

Create a mind map during or after the discussions. You can use an app or a computer program, a white board or a large sheet of paper. Let the mind map be displayed during your continued progress, so the students can add and extend it with new knowledge that they discover during the journey.


Objectives:

To visualize the students' understanding for recycling and creating a common ground for your work on recycling.

Grades: K - 3

Materials needed:

Access to tablets or computers as well as the game Grow Recycling. A program, board or paper and pen to make a mind map.

• Next Generation Science Standards & Common Core State Standards

- *K-ESS3-3.* Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
- *2-PS1-2.* Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

LESSON 2

WHAT IS PACKAGING?

What is Packaging?

A large part of what we recycle is packaging and newspapers. Packaging includes all materials used to wrap, protect or present a product. It is not always easy to know what constitutes a package. Learn more about it with this lesson!

- **Sorting Waste**

Invite students to bring clean garbage materials from home. Try to sort the materials according to what is categorized as packaging and not.

For example: a broken toy, a dish brush, paper tissue or clothes are not packaging. Look for recycling symbols on the packaging and sort them according to how

they should be recycled. What happens to those things that cannot be recycled?

You can also cut out images of packaging that you find in newspaper ads or ads from supermarkets. Group the different packages according to the materials they are made of and make a collage.



LESSON 2

WHAT IS PACKAGING?

• Packaging Through the Ages

How we package our goods has really changed over time. Before plastic started to be used in the mid-20th century, we had been using completely different packaging solutions.

Let students, in groups or individually, choose one product that has been around for a long time (e.g. milk, bread or flour) and let them do research about how the product was packaged 100 years ago. What did it look like inside the grocery store and how did people bring it home?

Students can interview an older person in their neighbourhood, or you can show photos of old grocery stores, or watch a movie showing its interiors..

You might even get lucky and find some old packaging like a milk bottle that you can bring to class.

Objectives:

To get a deeper understanding for how our recycling system works and what packaging is.

Grades: K - 3

Materials needed:

Different kinds of garbage materials, advertising-leaflets from grocery shops, supermarkets etc. that depict various packaged goods.

• Next Generation Science Standards & Common Core State Standards

- *K-2-ETS1-2.* Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- *2-PS1-1.* Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties
- *2-PS1-2.* Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.



LESSON 2: STUDENT SHEET

WHAT IS PACKAGING?

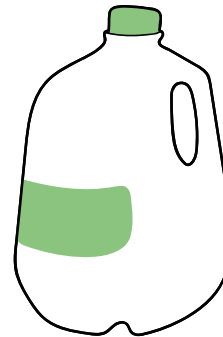
What is Packaging?

Investigate what packaging looked like a century ago, and draw them in the boxes below!

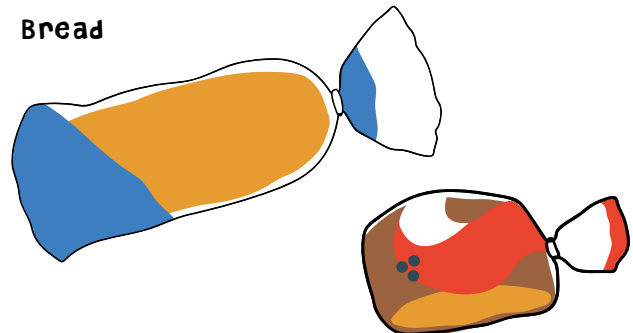
THIS IS WHAT PACKAGING USED TO
LOOK LIKE 100 YEARS AGO

THIS IS WHAT PACKAGING
LOOKS LIKE TODAY

Milk



Bread



Flour



LESSON 2: STUDENT TASK

WHAT IS PACKAGING?

What is Packaging?

THIS IS WHAT PACKAGING USED TO
LOOK LIKE 100 YEARS AGO

THIS IS WHAT PACKAGING
LOOKS LIKE TODAY

Candy



Pick your own packaging and draw
what it looked like 100 years ago.

LESSON 3

RECYCLED POSTCARDS

Recycled Postcards

Explore paper as a material, and try to recycle it yourself. Paper is one of the materials every student comes into contact with in their daily lives and that is available in many different forms. Take a look around in the classroom! Maybe you will find all of these different types of paper: notepad paper, newspapers and magazine paper, books, cardboard, tissue paper, gift wrap paper, toilet paper and wallpaper.

• Make your own Postcards

Take an old plastic container e.g. an icecream box or a reusable food container (preferably rectangular size) that matches the size you want your postcard to be.

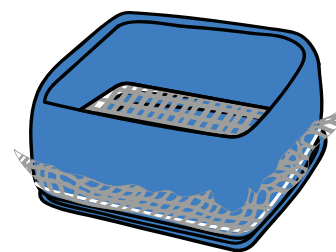
- Cut out the bottom of the container leaving only the frame and the lid.
- Cut out a rectangular shape in the lid of about the size of a postcard.
- Cover the frame of the plastic container with a rough mesh fabric, such as gauze weave, and then stretch and tighten it by attaching the lid (see figure).

Tear some old newspapers into small pieces and put them in a bowl of water. Leave the paper in the water for at least an hour while stirring it from time to time. Make sure there are no lumps of paper by mixing it with your fingers so that the pieces dissolve and

everything turns into a viscous pulp. Now you may decorate your paper by adding small petals, glitter, confetti or the like to the pulp.

Now dip the plastic container into the pulp with the lid facing downward so that just enough pulp gets caught on the mesh. Make sure the pulp is evenly distributed over the mesh. Now lift the container up and place it over the sink where it can drain and dry. You may also carefully wipe away excess water from underneath the fabric with a sponge. Carefully remove the lid and hang up the fabric or place it on a towel for the paper to dry completely.

Gently loosen the paper from the fabric when it is dry.



LESSON 3

RECYCLED POSTCARDS

• Durable Paper Fibers

Paper fibers used in newspapers can be recycled up to seven times before they are worn out. It is a hard-wearing material that should really end up in the right place - in recycling!

You can start by testing the paper fibers durability.

Test to see what happens to the fibers when you expose them to different kinds of “stress-tests”: Place pieces of a newspaper in a glass of water - hot or cold.

Perhaps you can add something to the water to see if the fibers will be affected by it? Bury some pieces of a newspaper in the ground covering it with soil. Soak pieces of newspaper in water or put it in the freezer for 24 hours. Let your students brainstorm and come up with suggestions for testing!

Objectives:

To examine the properties of different materials and find out how the actual recycling process for the material works.

Grades: K - 3

Materials needed:

Newspapers, a rectangular plastic container/box, gauze weave or fine mesh fabric, a tub of water (should be bigger than the plastic container)

• Connections to the Next Generation Science Standards

- *K-2-ETS1-2.* Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- *2-PS1-1.* Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties
- *2-PS1-3.* Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.



LESSON 4

A RECYCLED ORCHESTRA

A Recycled Orchestra

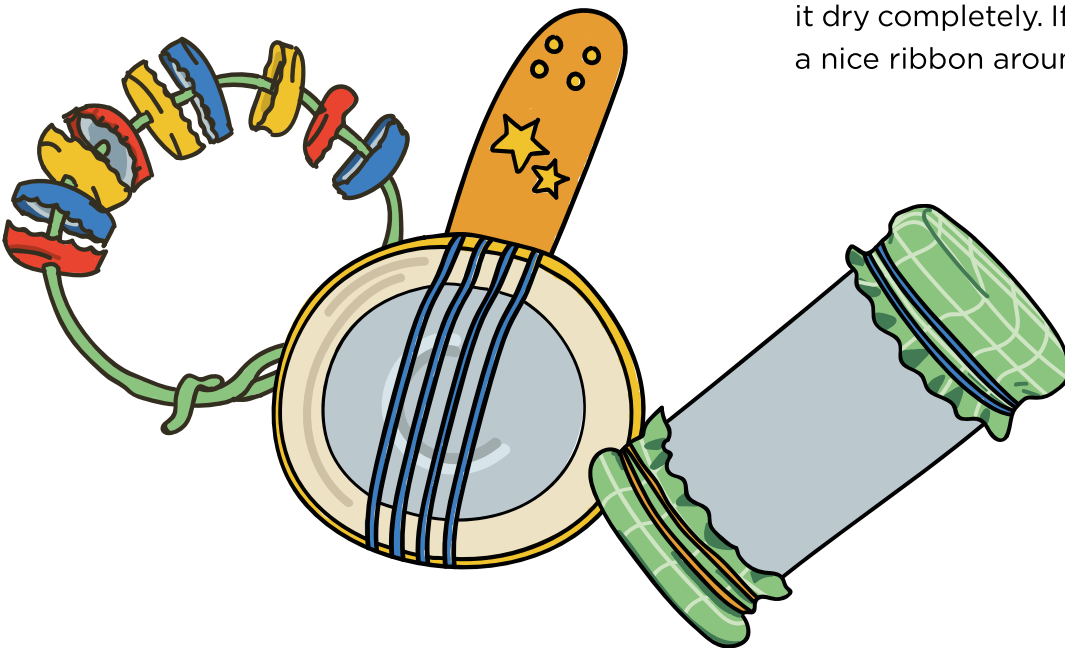
Did you like to play on the recycling machines in the game Grow Recycling? Make your own musical instruments out of old packaging and play and sing along in a recycling song! Or use the music in Grow Garden as a background beat and jam along with it!

- Bottle Top Tamburines**

Collect metal bottle tops and make holes in them with a hammer and a nail. Take two pipe cleaners and twist them together to make them a little thicker. Place the tops together two by two and rattle away!

- Paper Roll Maraca**

The students bring a toilet paper roll each from home and decorate them by painting, putting on fabric or silk paper. Cut circles of fabric, about 7 cm in diameter. Put glue on one end of the roll and fasten the fabric circle. Put a rubber band over until it has dried. Fill the roll by half with pebbles, rice or macaroni. You can experiment and see how the content affects how the maraca sounds. Do the same with the other end and let it dry completely. If you like you could tie a nice ribbon around the edges.



LESSON 4

A RECYCLED ORCHESTRA

- **Jar Lid Banjo**

Take a rubber band, preferably loom bands that are a bit smaller. Wrap them around a jar lid and attach them with tape, preferably a stronger tape like duct tape.

Take a wooden stick, like an ice cream stick or preferably a bit larger (can be ordered on the Internet) and attach with glue to the back of the lid, on top of the tape and the rubber bands. Decorate the stick with paper tape.

Objectives:

To have fun! To integrate art, music and construction in the theme of recycling and show how materials can be used in new ways and seen as a resource rather than garbage.

Grades: K - 3**Materials needed:**

Bottle tops, pipe cleaners, toilet paper rolls, fabric, rubber bands, pebbles, rice or macaroni, jar lids, ice cream sticks.

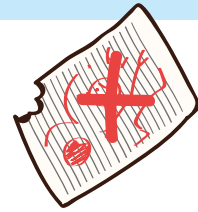
- **Connections to the Next Generation Science Standards**

- *K-2-ETS1-2.* Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- *2-PS1-2.* Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- *2-PS1-3.* Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.



LESSON 5

COUNT YOUR GARBAGE



Count Your Garbage

In modern times, the amount of waste we produce has increased in many countries. In this exercise you will reveal the amount of garbage you actually produce, and what type of waste it is. The students will practice making diagrams and make comparisons.

Ask the students to count the amount of waste generated at home during two weeks. A way to approach this is through counting how many bags of waste are being disposed from the house during that time.

The students can use the attached student sheet to mark how many bags of each waste type they dispose, which will result in a staple diagram of the different waste types. For each bag of waste the student may fill out one box in the diagram, starting from the bottom.

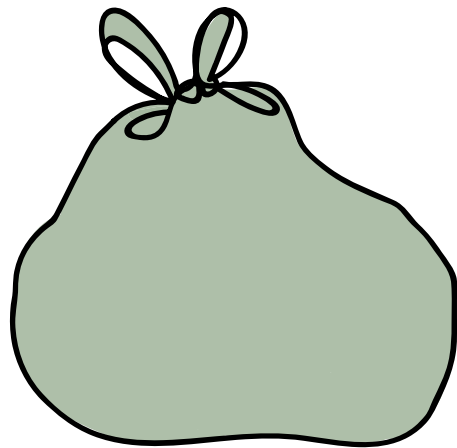
Before beginning the task, first explain how a staple diagram works and how the students may use it.

Presumably, the students will have many different sizes of garbage containers at home. If you want to remain as accurate as possible you may agree on a standard size of the bags you will use for measure.

When the two weeks are over, the students will bring their filled-out diagrams to school and compare their results.

• Questions to Discuss

- How much garbage of each type did we end up with?
- What was the most common kind of waste?
- Why do you think that is?
- How much waste would that make in a year?
- How much waste would be generated if everyone in the area where you live produced that amount of garbage during a year?
- Is this amount comparable to the size of a football field or a building?



LESSON 5

COUNT YOUR GARBAGE

• Suggestions for Further Studies

- Try combining the results and make a joint diagram for the whole class. Consider how it could be made, e.g. how big you can make it, if different colors are needed for the staples, or if it can be made three-dimensionally.
- Give each student a diagram, and let them build their own building block staples for each waste type. This allows the student to interpret a two-dimensional drawing into a three-dimensional shape.
- Continue counting your garbage, and find out how much waste the whole class produces throughout a whole year.

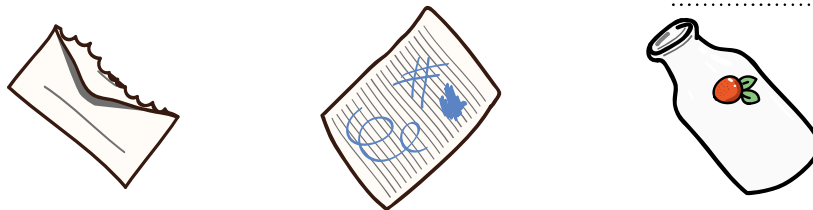
Objectives:

To get an understanding of the amount of waste we produce, and what types of waste are produced more than others. To carry through a task of scientific investigation and document the results.

Grades: K - 3

Materials needed:

Student sheet. Eventually building blocks or big sheet of paper, scissors and glue.



• Connections to the Next Generation Science Standards

- *K-2-ETS1-2.* Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- *2-PS1-1.* Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties

LESSON 5: STUDENT SHEET

COUNT YOUR GARBAGE

Count Your Garbage

Count all the waste that is generated at home during two weeks. Make an X in the boxes for each bag of garbage. Start from the bottom of the stacks and work your way upwards.

Amount of bags ↑	20						
	19						
	18						
	17						
	16						
	15						
	14						
	13						
	12						
	11						
	10						
	9						
	8						
	7						
	6						
	5						
	4						
	3						
	2						
	1						
	General Waste	Plastic containers	Paper containers	Newspaper	Metallic containers	Glass containers	
	Types of Waste →						

LESSON 6

MOVING UP THE WASTE HIERARCHY

Moving Up the Waste Hierarchy

Recycling is one way to make use of our planet's resources, but there is more we can do to reduce the amount of waste we produce. The waste hierarchy shows how we ought to prioritize and act.

- **Build the Hierarchy**

Recycling on its own is not sufficient, and we have to move up the waste hierarchy to really reduce the amount of waste we produce too much of. This entails a greater focus on re-using and reducing the consumption of products.

The waste hierarchy displays the best alternatives to avoid using too much of our valuable resources. Moving up the waste hierarchy means that we save resources, money, as well as our planet. Use the student sheet that comes with this lesson and cut out the images. Divide the students into groups and let them put the images in the correct order in the hierarchy. Ask them how they reasoned.

Reduce: Firstly, it is of importance to make as little waste as possible. We can do this through primarily consuming as little as possible, as well as manufacturing products using less resources.

Re-use: Make sure your old things are re-used through either giving them away, selling them, or up-cycling them into something else.

Recycle: If the items are impossible to re-use, the raw materials should be recycled as much as possible. We can do this through recycling packaging and newspapers, and composting food scraps.

Energy Recovery: If a material can't be recycled, it may get burned in a power plant, which transforms the energy in the waste into electricity and heat.

Disposal: Disposed waste is being put in landfill. It is not a good alternative, but it still happens in many countries around the world.

Litter: Unfortunately, a part of our waste ends up outside the waste-management system, and ends up as litter both on land and in our oceans. Littering entails a massive waste of resources, and is in many ways bad for the ecosystems, as well as for humans.



LESSON 6

MOVING UP THE WASTE HIERARCHY

• What Can You Do?

Ask the students if they can think of any actions that fit the different steps in the waste hierarchy. E.g. how you can re-use or consume in a better way at home or in school. Write down the suggestions on sticky notes and put them up on the wall. Pick out the suggestions that you would like to implement at your school.

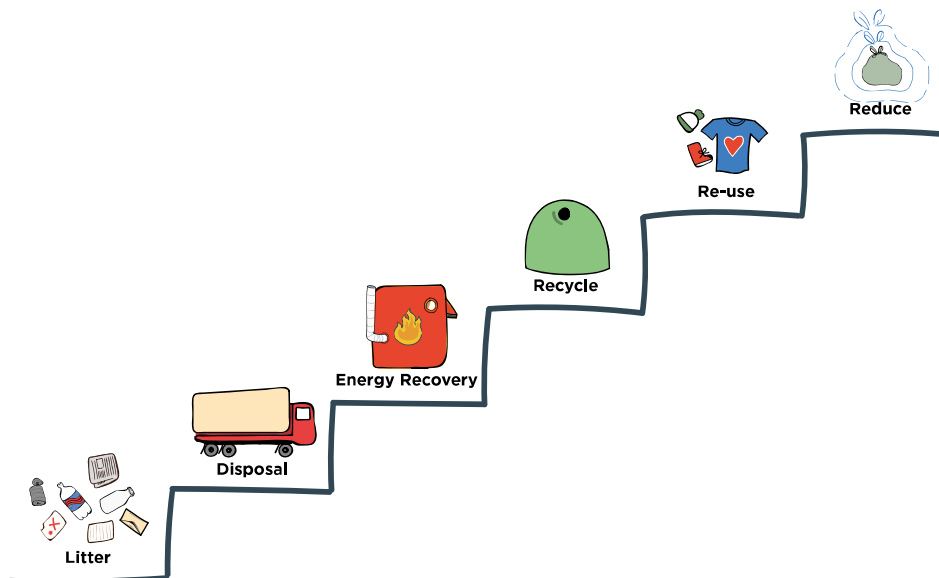
Objectives:

Giving students insight in the handling of waste and how everyday choices affect the environment.

Grades: K - 3

Materials needed:

Printed versions of the student sheet that comes with this lesson, scissors to cut the pieces out.



• Connections to the Next Generation Science Standards

- *K-ESS3-3.* Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

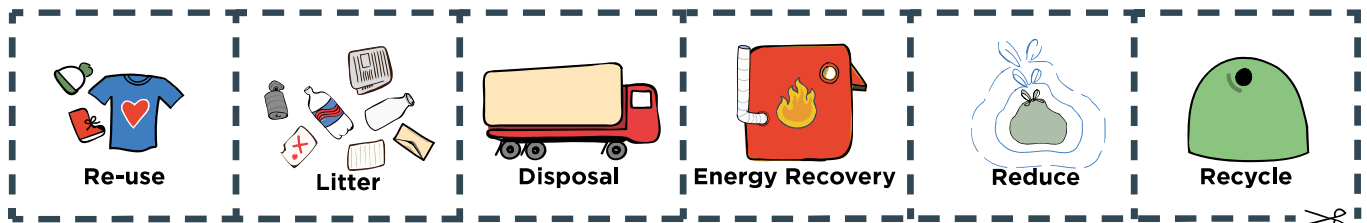
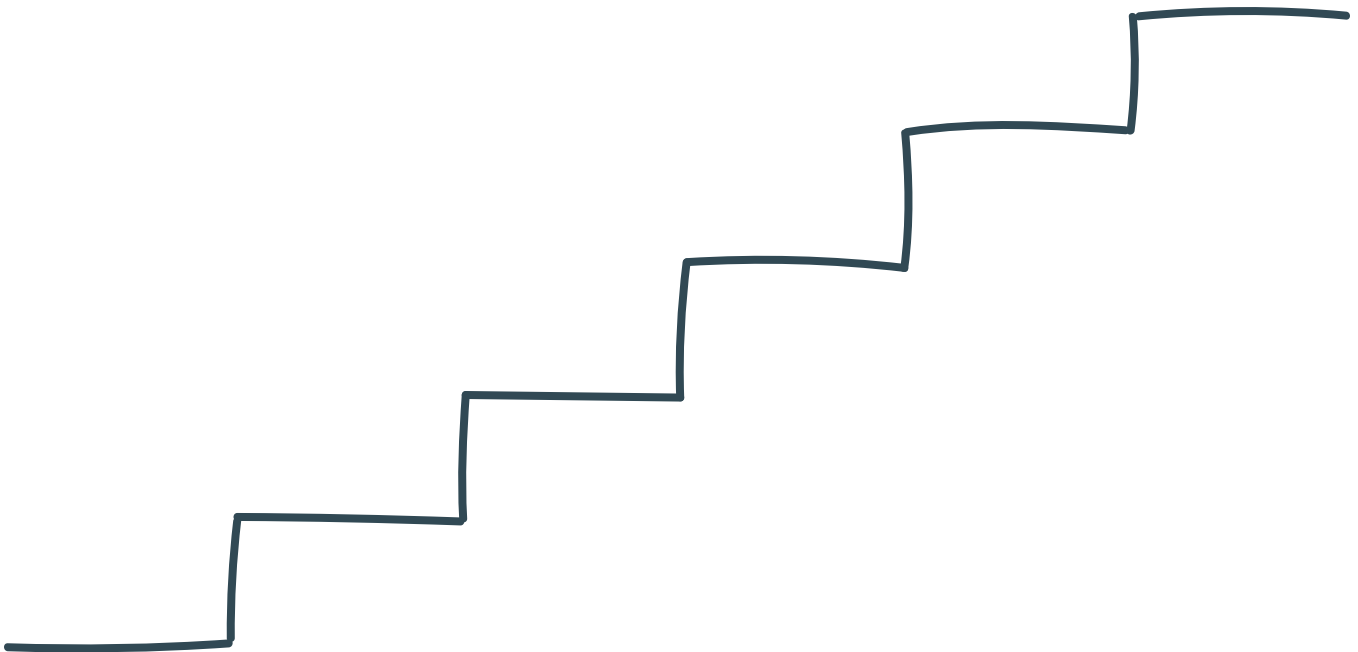
LESSON 6: STUDENT SHEET

MOVING UP THE WASTE HIERARCHY

Moving Up the Waste Hierarchy

There are several things we can do to minimize the waste we produce. Some are better to do than others, in order to achieve as little waste as possible.

Cut out the pictures and put them in the correct order on the steps. Put the worst option on the bottom step, and the best option on the top step.

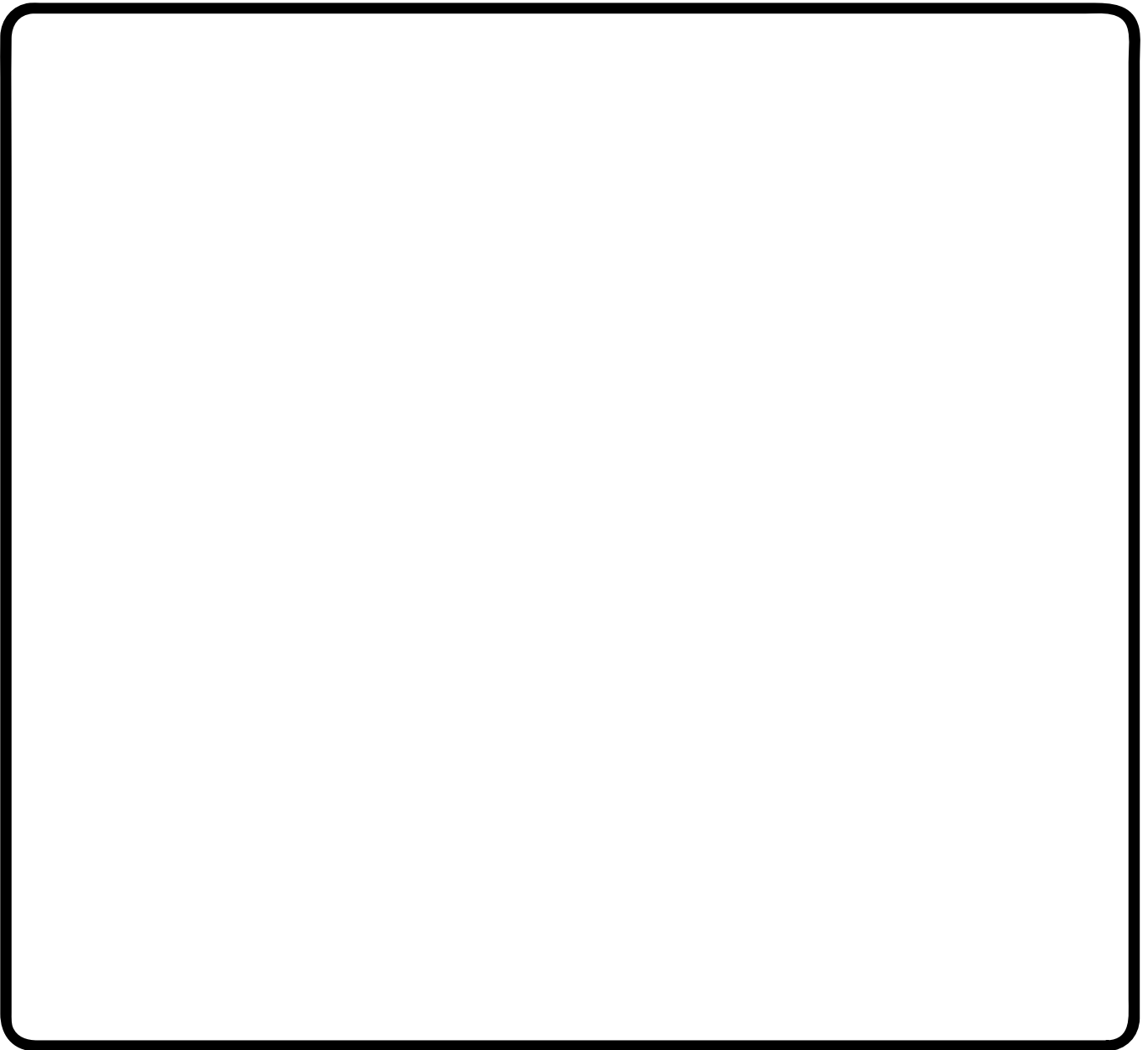


STUDENT ACTIVITY

YOUR OWN RECYCLING BIN

Your Recycling Bin

What would your own recycling bins look like if you got to decide? Draw pictures of recycling bins that would make recycling more fun!



STUDENT ACTIVITY

FIND THE PLASTIC

Find The Plastic

Mark all packaging that you think is made of plastic.



STUDENT ACTIVITY

MATCH THE WASTE

Match the Waste

Draw a line matching each kind of garbage with the correct recycling bin.



PLASTIC



METAL



COMPOST

STUDENT ACTIVITY

RECYCLING STORY

Recycling Story

Write a story about a package's journey through the recycling system. Perhaps you can write about a soda can or a magazine being recycled. At least three of the words in the box should be included in your story!

TRUCK BOTTLE SEAGULL GARBAGE GROCERY STORE FACTORY CLOWN MELT METAL CAN
STREET NEWSPAPER ZOMBIE CRANE MACHINE RECYCLING BATTERY
BIN HEAT BIKE GLASS JAR ENVIRONMENT HAPPY

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STUDENT ACTIVITY

THE SECRET CODE

Solve the Secret Code

Solve Banja's secret message! Do the addition or subtraction below. Use each answer to find the right letter in the box.

A = 1	K = 11	U = 21
B = 2	L = 12	V = 22
C = 3	M = 13	W = 23
D = 4	N = 14	X = 24
E = 5	O = 15	Y = 25
F = 6	P = 16	Z = 26
G = 7	Q = 17	
H = 8	R = 18	
I = 9	S = 19	
J = 10	T = 20	



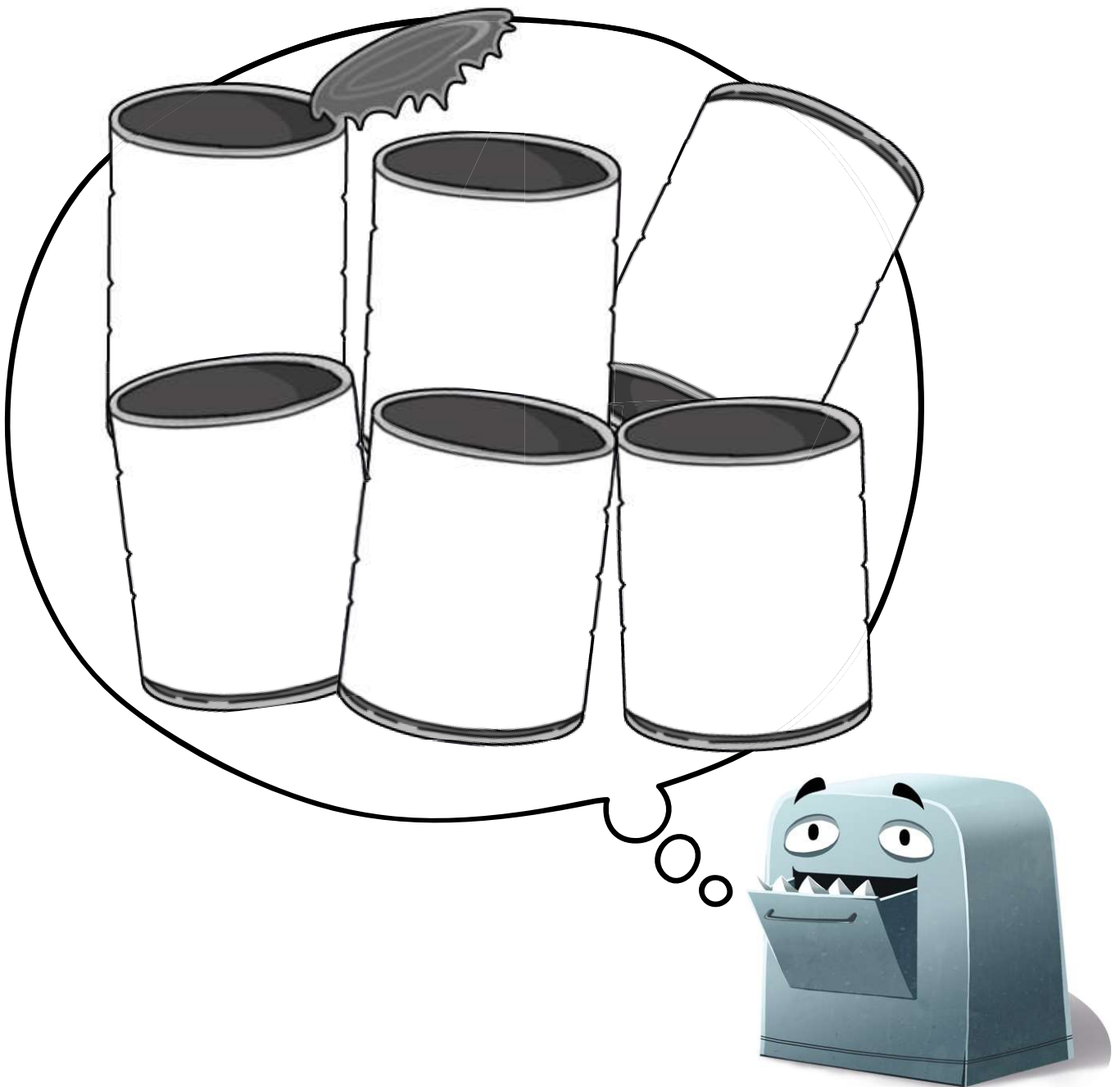
$1+1$	$3-2$	$10+4$	$4+6$	$6-5$	$9+2$	$6-5$	$9+5$	$5+3$	$9+8$
$5+10$	$20+4$	$10-7$	$15-4$	$8-3$	$9+9$	$24+2$	$15+5$	$8-3$	$15+3$
$25-3$	$6+3$	$20-6$	$9+5$	$15-6$	$17-3$	$11-4$	$25+2$	$20-2$	$10+9$
$9+4$	$3-2$	$23-5$	$24-4$						

STUDENT ACTIVITY

MAKE NEW LABELS

Make New Labels

Tin cans are Gofh's favourite food! But do you know what was inside these cans before? Perhaps crushed tomatoes? Sliced pineapples? Write and draw new labels on the tin cans!



STUDENT ACTIVITY

WHAT IS BANJA RECYCLING?

What is Banja Recycling?

Banja is on her way to the recycling bin with something. Can you figure out what she brought? Cut out all the different pieces and put them in front of you. Put Banja with her nose forwards on the square marked with "start". Then follow the arrows in the instruction.



means take a step forward.



and



means turn.

Banja stops at the end of each row of arrows. Write down the letters Banja ends up on!

R	Z	H	P	Y	W
A	G	T	J	O	E
D	L	F	N	Q	K
M	S	C	U	B	X
			V	I	start

..... start ↑↑↑↑↶↑↑↑↑↑

..... start ↶↑↑↑↷↑↑↑↑↑

..... start ↑↑↑↑↶↑↑↑↑↑

..... start ↑↶↑↑↑↑

..... start ↶↑↷↑↑↑↶↑↑↑↑↶



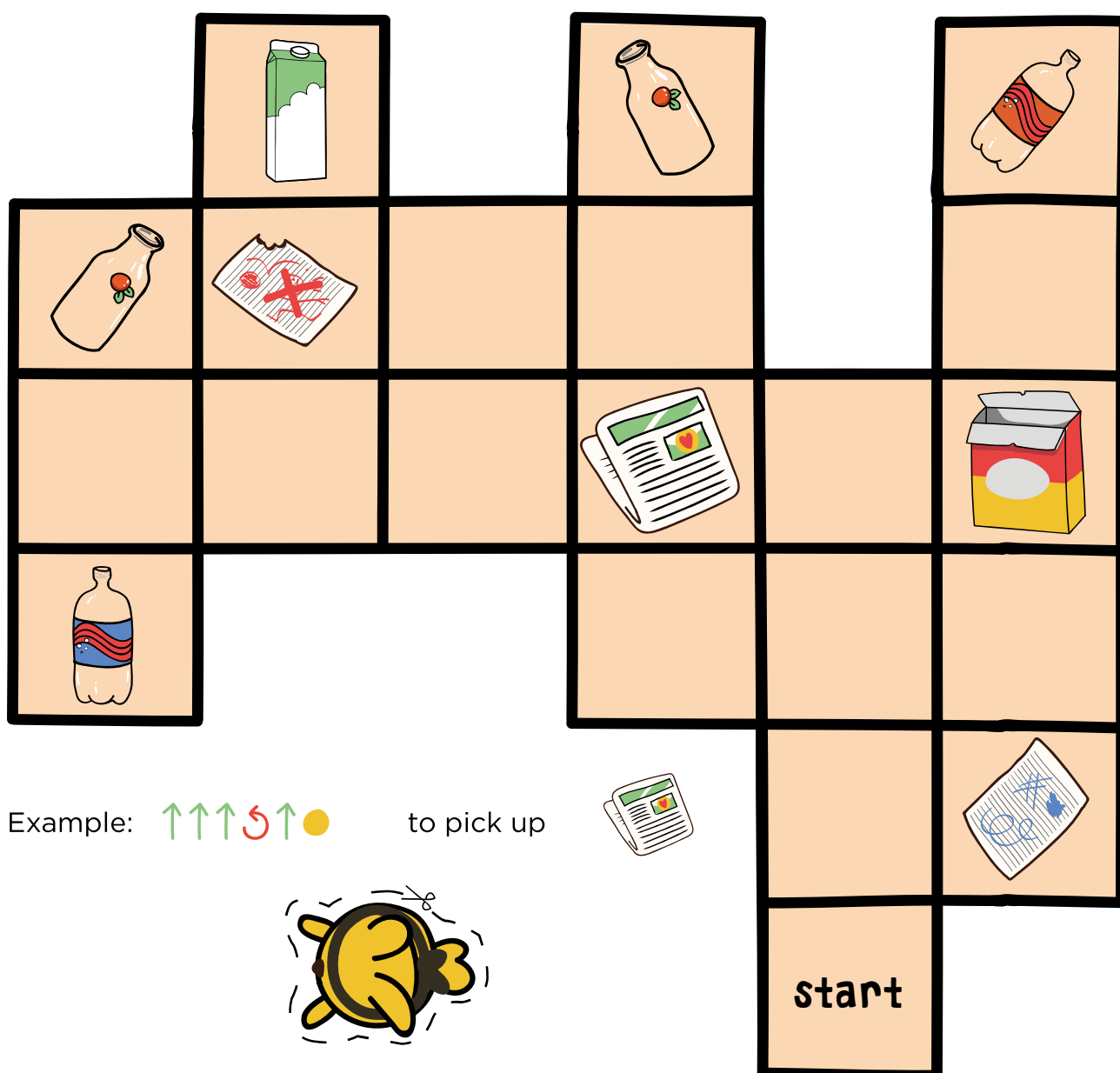
STUDENT ACTIVITY

COLLECT WASTE

Collect Waste

Banja is picking up waste for recycling. Draw instructions with arrows that show how Banja should walk in order to collect the waste. Work together with a classmate. Choose one type of waste each to pick, write instructions on a separate piece of paper, and then swap the instructions with each other so you can see that it works. Cross out the waste you have picked up. ↑ means take one step forward. ↻ and ↺ means turn.

● means pick up garbage.



Example: ↑↑↑↻↑● to pick up



QUIZ WALK

RECYCLING

1. What word describes used materials that are being made into new things?

1. CIRCLING

2. RECYCLING

3. CYCLING

QUIZ WALK

RECYCLING

2. Why should we recycle?

**1. TO HELP CONSERVE
OUR NATURAL
RESOURCES, SUCH AS
TREES, OIL, AND METAL**

**2. BECAUSE YOU
WOULD GET CANDY**

**3. WE DO NOT NEED TO
RECYCLE**

QUIZ WALK

RECYCLING

3. Recycling one glass bottle saves enough energy to power a 100-watt light bulb for...

1. 1 HOUR

2. 3 DAYS

3. 4 HOURS

QUIZ WALK

RECYCLING

4. If you started digging a hole in the ground 1000 years from today - which of these items would you be able to find remaining from our time?

1. BANANA PEEL

2. A GLASS BOTTLE

3. NEWSPAPER

QUIZ WALK

RECYCLING

5. Which material can be used again and again if it gets recycled?

1. WRAPPING PAPER

2. PLASTIC

3. ALUMINUM

QUIZ WALK

RECYCLING

6. How long does it take nature to break down an empty soda can?

1. 300 YEARS

2. 100 YEARS

3. 5 YEARS

QUIZ WALK

RECYCLING

7. Which product can plastic bottles NOT be made into when being recycled?

1. CANDY

2. NEW PLASTIC BOTTLES

3. FLEECE JACKETS

QUIZ WALK

RECYCLING

8. How many times can paper be recycled before the paper fibers are worn out?

1. UP TO 7 TIMES

2. 3 TIMES

3. PAPER FIBERS NEVER WEAR OUT

QUIZ WALK

RECYCLING

9. One recycled tin can would save enough energy to power a television for...

1. 1 HOUR

2. 24 HOURS

3. 8 HOURS

QUIZ WALK

RECYCLING

10. What can organic waste (e.g. a banana peel) become if it gets recycled?

1. PAPER FOR COMIC BOOKS

2. BIOFUEL TO POWER BUSES

3. CINNAMON BUNS

QUIZ WALK

RECYCLING

11. In Grow Recycling - the game - there is a recycling container who loves eating metal. What is its name?

1. BANJA THE BUNNY

2. PETE THE PAPER BIN

3. GOFH

QUIZ WALK

RECYCLING

Correct Answers

Question 1	2. Recycling
Question 2	1. Recycling helps to conserve our natural resources
Question 3	3. 4 hours
Question 4	2. A glass bottle
Question 5	3. Aluminum
Question 6	1. 300 years
Question 7	1. Candy
Question 8	1. Up to 7 times
Question 9	3. 8 hours
Question 10	2. Biofuel to power buses
Question 11	3. Gofh

