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PLASTEAM

STEAM-Box

EDUCATIONAL MATERIAL

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PLASTEAM: STEAM education for plastic-free primary schools
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Intellectual Output 3
A2. STEAM-Box activities and tools

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Aim and scope

PLASTEAM is an Erasmus+ project that aims to contribute to the awareness raising, sensitization and education of students and teachers of primary schools about the plastic pollution problem, and in particular, Single Use Plastics (SUPs) and the sustainable ways of managing them at school level.

STEAM-Box is a key-outcome of the project. Even if physically it could have the form of an actual "Box" with printouts, it is, in fact, an e-toolkit, an educational material with activities or lesson plans. The "Box" concept serves one more purpose: In contrast with the linear sequence that usually characterizes a school curriculum, this toolkit proposes a "menu" to choose from, allowing only parts of its content to be applied.

Aim: The overarching goal of STEAM-Box is for its end users -both teachers and students- to adopt informed and responsible behavior regarding plastic use and management. More specifically, the STEAM-Box invites to:

- Discuss challenges posed by the unsustainable plastics' consumption and production patterns in modern societies.
- Rethink of their own attitudes/behaviors associated with plastics, particularly SUPs.
- Become aware of the impacts of unsustainable disposal of plastic waste and SUPs.
- Get inspired by good practices in plastic minimization and waste management.
- Take informed decisions and responsible choices regarding plastics at the school, household, and community level.
- Progressively become "agents of change".

Target-group: The STEAM-Box is designed to be mainly used by teachers of primary school that teach students aged 9 - 12 years old, however it can be adapted for younger or older ages. In this respect, its target audiences embrace teachers, students, non-formal educators as well as parents and families.

Read more on the **Methodology** guiding the development of STEAM-Box.

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How to use this material

Before using this material, the following clarifications on behalf of the authors may be helpful:

- Even if the activities (or lesson plans) are numbered, there is **no sequence** in applying them, and most of them do not require previous knowledge on the concepts dealt. Depending on the time, experience and preferences of your learners, you can choose to apply only one or a couple of activities. In case of longer projects (e.g. extending for a school year) we propose to start from Activity No 1, and then depending on your results, be directed to another STEAM-Box activity.
- The material is authored for educators, not learners, that is why it does not contain over-detailed instructions, nor worksheets. It is thought that each educator that applies it, depending on the context and the depth of application, will **take ownership** of the activity. Therefore, educators can modify the content of the activities, remove or add more steps, resources etc. as deemed necessary, and also develop worksheets enabling a more detailed scaffolding process for their students. The follow up and extension ideas given in each activity can evolve as an entire autonomous activity.
- Most activities start with a **warm-up** to attract interest, go on with some enquiry-based tasks and end with an evaluation (**Reflection / Debrief**) step, where we sum up key-learnings, take-aways and insights. These first and last steps are important in the learning process and should be kept.
- Each activity contains **small theory chunks** (or key facts), in order to not overburden the teachers. The interested to learn more reader is advised to browse in the recommended websites given in each activity. These websites can be used by the educator or shared with the learners as scientific accurate sources of information.
- The original material has been authored in **English**. Small adjustments and modifications are done by the partners in the **national versions** of the material (IT, GR, NL, MT, RO), in order for it to be more relevant in their countries, in terms of educational contexts, and waste management realities.
- **Practice makes perfect** says an English proverb. Despite the collective efforts and expertise put in authoring the material, there is always room for improvement. The Info Days within the PLASTEAM project, where the material will "field-tested" are expected to generate useful comments and suggestions to improve and enrich it. All comments are welcome at: **info@medies.net.**

1) Burning questions on plastics

This is an introductory activity, in which we brainstorm on what learners know and/or wish to know about plastics. Based on their questions and wonders, the class may be then orientated towards another relevant activity of STEAM-Box.

Learning objectives

To realize how plasticized our lives are
To practice creative thinking
To engage in dialogue and reach consensus

Estimated Duration

45 min

Materials & Equipment

A big sheet (or white board), markers, pens pencils, post-it papers, devices with internet

Key Facts / Useful Information

- Today our lives are deeply connected to plastic, but it wasn't always the case: Plastic was only invented at the turn of the 20th century, however, in the last fifty years, due to its unique properties, plastic has replaced all other materials to a point where our life today would be unthinkable without it.
- A big part of today's plastic production is meant to be used only once (Single Use Plastics – SUPs). For instance, an average plastic bag has a typical "working life" of just 15 minutes. Packaging accounts for over 40% of total plastic usage.
- Nearly every piece of plastic ever made still exists today. Why? Plastic never truly breaks down in nature. It breaks into smaller and smaller pieces (microplastics) that are impossible to remove. Plastic fibres (e.g. from cosmetics, clothes, etc.) find their way into fresh and marine water bodies. Inevitably marine life consumes this "plastic dust".
- Of the hundreds of types of plastics found in modern products, not all can be recycled: in practice it is feasible (commercially viable) to sort and recycle only a handful of types. It is estimated that only 9% of global plastic gets recycled.
- The alarming rate of plastic pollution (mostly SUPs) in European seas and costs has led the EU to enforce an ambitious law that bans a number of SUPs, such as straws, cutlery and products from Polystyrene and regulates others.

Process Step-by-Step

1. WARM-UP: Ask students to mentally draw a hypothetical circle around their body with a radius of 1 meter, and count the number of objects in it that are made of plastic or that have plastic in them. The answer may surprise them! Beware to count objects like shoes, back-packs, clothes with Polyester, even the sticker on their banana!
2. Ask students to make a mind map on things they already know about plastic, e.g. where it comes from, its possible uses, types of plastic, how it is disposed of, if it can be recycled, threats it poses to wildlife.

3. Some of the concepts of the mind-map may generate new questions. Hand out post-its and ask students to individually note down possible questions /wonders they might have on plastics. Encourage open questions and welcome all kinds of wild questions!
4. Students share their questions through a "Think-Pair-Share" activity. Some questions can be grouped in clusters. Attention: Some of the questions may be answered on the spot by a simple online search, some will require a thoughtful reflection, a survey, or even an expert opinion.
5. If you wish to run a project as a class and delve deeper in any of the issues raised, ask students to rank their collected questions from the most to the least interesting. While doing so, they could re-position or re-cluster their questions (post-its). After dialogue, they should agree on the ranking and on the questions on top ('hot' ones).

Indicative questions given by PLASTEAM Partners during a project meeting:

- How is the raw material for plastics being processed?
- Does plastic need to be clean in order to recycle it?
- Are there other materials to safely preserve food (air & water proof)?
- Why does so much plastic end up in the sea? What can I do to avoid it?
- What is bio-plastic? Is it bio-degradable?
- How many years does it take for plastic to break down?
- How many types of plastic are there?
- Why is plastic not compostable?
- Are there plastic microfibers in our drinking water?

6. FOLLOW-UP: Brainstorm and decide how you will address the questions on top of the ranking. Another STEAM-Box lesson may be helpful. Depending on the nature of the 'hot' questions, students may split and work in groups to try to answer them.

   TIP: Take a photo of the mind-map and the ranked questions: these can guide you in your future pathways, as your project evolves.

Reflection / Debrief

Ask students how they felt during the negotiation and the ranking process:

- Were they open to listen to the arguments and ideas of their classmates?
- Did all students feel included? How did the group treat 'surprising' 'unexpected' questions?
- Were all students happy with the final ranking?
- If they would re-do such a discussion in the future, what would they change?

Websites to learn more

Plastic Atlas: (2019) https://www.boell.de/en/plasticatlas
A brief history of plastic (TEdED video): https://youtu.be/9GMbRG9CZJw
Facts on Plastic pollution: https://plasticoceans.org/the-facts/

2) Lunchbox leftovers audit

In this activity we analyse the waste created by our classes' lunch boxes in a normal school day. Starting from the analysis of this waste, we discuss possible changes we could make in order to reduce it.

Learning objectives

To practice STEAM (math) skills
To be reminded of what can be recycled in our school / region, and how
To think of ways of reducing one's own waste

Estimated Duration

45-60 min

Materials & Equipment

Notebooks, pens, camera, a bin to empty the lunch boxes and a carton surface (e.g. from an unused paper box) to spread it

Process Step-by-Step

1. WARM-UP: Have your students ever wondered how much waste comes from their lunch-boxes every day, how much of it is plastic and how much could be better managed or avoided? Explain to students that we will analyse the leftovers of our lunchboxes.
2. Ask students to keep any wastes created during lunch-time, and after lunch ask them to empty the leftovers of their lunch-box on a bin or a carton box.
3. Analyse this waste through these questions:
   a. How many waste items are there in total?
   b. How many pieces of packaging are present? Out of which materials? Which can be recycled? How many are SUPs?
   c. How many pieces of compostable waste are present?
   d. How many pieces of waste come from home and how many from the canteen?
   e. How should these wastes be sorted using the bins in their school?
   f. Could any of these wastes be avoided?
4. Ask students to work in pairs to graphically represent the results of the bin audit. They should decide together what type of data is more crucial to communicate (e.g. types of materials found; compostable or non-compostable; SUPs percentage, etc.) and with what types of graphs (e.g. pie, bar chart etc.) and
5. Invite each pair to share their graphs with another pair and compare the ways they chose to present the audit findings: what is similar and what is different?
6. Discuss what does the amount and type of waste generated by the class' lunchboxes tell us about the environmental and social values of the class? In what ways are we consuming responsibly, or, on the other hand recklessly?

> Tip for teachers!
>
> The common bin is used in order to avoid individually identifying what each student has in their lunchboxes, which may cause them to feel embarrassed or ashamed. In case you do not want to use the actual bin's content with the students, you could instead spread it in a surface and take photos.

7. Give some time to students to browse in the webpage of their local waste management / recycling / composting facilities, in order to be reminded of the processes and the possibilities of waste management in their municipality.
8. Brainstorm for ways we could decrease the amount of waste we create. The students' ideas may refer to the plastics and SUPs, but not only: welcome ideas pointing to the decrease of food-leftovers or the improvement of waste management in general.

Reflection / Debrief

Ask each student to mention (or write autonomously) a striking impression, or learning, or an insight from today's activity, that he/she will convey to his/her family. Use these reflections as an opportunity to explain that even if it is hard for a kid to have an impact on the family shopping, they can help their families to make better choices, e.g. by:

- Encouraging them to buy food and other things that come in packaging that can be recycled.
- Encouraging them to choose products without packaging or with a 'natural' packaging (e.g. un-bagged bananas or apples).

Extension ideas

- Re-run the audit after one month to check if any of the ideas discussed in Step 7 are applied, resulting to less waste.
- Watch the 2.5min **video on the conscious consumer** and discuss the meaning of the concept. Reflect on steps students could take to be a conscious consumer.

Websites to learn more

PLASTEAM's Recommendations for 'plastic-free' schools: https://plasteam.eu/o2-plastic-free-schools-recommendations-and-contest/

3) My plastic footprint diary

In this activity together with our families we record and temporarily store all plastic waste generated within a week at a house level. We then compare our sums and reflect whether we could have avoided or better managed a part of this waste.

Learning objectives

To systematically self-monitor and record a personal consumption habit
To differentiate between single-use-plastics (SUPs) from plastics designed to last
To practice STEAM (math) skills
To think of alternatives of SUPs

Estimated Duration

Two 45 min sessions with one week in between

Materials & Equipment

Notebooks, pens, camera, photocopies of table, 1-2 big bags per student to store plastic waste

Process Step-by-Step

1. WARM-UP: Watch the **video** or a **photo** of an American activist that wore his trash for 30 days in order to create a shocking visual and make people re-think on the amount of plastic waste they generate. Have your students ever wondered how much plastic they themselves discard in a week?
2. Ask students to estimate (and take note of) the quantity of plastic waste they generate - in number of items- and describe how they typically manage it at home.
3. Propose to students to hold a plastic waste monitoring for one or more days. The systematic recording of plastic waste for a while at home will allow us to define its amount and reflect on ways to reduce it. Depending on the age and interests of the students discuss and agree on the recording period (from one day to one week).
    a. We clarify that our activity does NOT target food leftovers, neither paper, glass or metal, but only plastic. We explain what we will be monitoring and how, so that we all "count" plastics in the same way. For example, Tetra-Pac and other multilayered containers as well as toys and markers, will be counted and bottle caps need to be counted separately from the bottles. We stress that the collected

Dear [name of parent],

Please join us this week/day in counting our plastic waste! Support your child in a. rinsing, and squeezing b. collecting, and counting the plastic items you dispose of as a family.

During the recording period please collect and count the plastic waste you would otherwise dispose elsewhere during your day (e.g. school, work, outside). The total amount might sock you! Through this recording, we hope that all of us will re-consider our plasticized-lives, and think how we can cleverly minimize Single Use Plastics (SUPs) without lowering our living standards.

Teacher of 5th Grade

items need to be clean in order to avoid odors and hygiene issues, so some – particularly those containing food- will require rinsing.

b. We propose to run the activity at a home level and ask all family members to join (see a Model Info Note for parents).

c. During the recording period students can do an online survey on how waste is managed and recycled in their region (this differs from county to country and even from region to region) and how much (plastic) waste generated on average by citizens in their country.

4. At the end of the recording period ask students to bring their filled bags to class and compare their filled tables. Based on the total quantities they calculate personal averages. They can also make diagrams and project the annual or lifetime plastic footprint of themselves and their family.
5. The amount and types of plastics recorded by students provide a good opportunity to discuss whether these were all necessary to us. Indicative questions to ask:
    a. Which of these plastic items make your life better / easier How so?
    b. Which items could you replace with greener alternatives (e.g. family size)?
    c. Which ones could you reduce in number and which ones could be avoided?
    d. Are any of these items commonly found on European shores?

Reflection / Debrief

Since the activity was applied at a home level, ask students to reflect on discussions they had at home, during the week, as their pile of plastics increased. How did the adults respond?

Extension ideas

- Extend the activity to 1 month and check if the simple action of self-monitoring and recording one's plastic waste actually contributes to its reduction. Alternatively, during this month you can opt to monitor only five symbolic Single Use Plastics through the **PLASTEAM App**.
- Ask students to look up for recipes in order to make their own toothpaste, or soap, or shampoo, and re-do the 'plastic footprint' activity a few weeks later, to see if the plastic use is decreased.

Websites to learn more

Plastic-free home: https://friendsoftheearth.uk/plastics/living-without-plastic

EEA Marine Litter Watch what is found in European Coasts https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/assessments/marine-litterwatch/data-and-results

My family's weekly plastic consumption!

Name _________________________ Start Date ____________

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2 bottles	_____	________	_______	____	_____	_____
1 tetra-pac	_____	________	_______	____	_____	_____
3 caps	_____	________	_______	____	_____	_____
_____	_____	________	_______	____	_____	_____
_____	_____	________	_______	____	_____	_____
_____	_____	________	_______	____	_____	_____
_____	_____	________	_______	____	_____	_____
_____	_____	________	_______	____	_____	_____

Total: ___ items for ___ people, or ___ items per person.

4) Labels in plastic and other products

Understanding the labels in packaging of products can be a puzzling exercise for consumers: What are products made of? Are they made from recycled raw material? Are they recyclable or compostable and under what conditions? In this activity we learn to decode the labels!

Learning objectives

To understand the labels found in the packaging of products
To practice observation and interpretation skills
To realize that not all plastics can be easily recycled
To manage plastic waste responsibly

Estimated Duration

45 min

Materials & Equipment

Various empty and clean packaging items, notebooks and pencils

Key Facts / Useful Information

- Some of the plastics we commonly use are recyclable, but not all. Plastics are classified with an internationally recognizable label, a triangle formed by three arrows and a number from 1 to 7. This label that resembles the recycling symbol confuses consumers, who mistakenly believe that all plastics (numbers) can be recycled. Attention! The marking 1-7 indicates the raw material of the plastic, regardless of whether it can be recycled or not.
- From the hundreds of types (codes) of polymers found on the market today, very few can be practically recycled (4 or 5 codes depending on the factory). The safest way to find out exactly which plastics are recycled in our area is to consult our nearest recycling facility.

Process Step-by-Step

1. Gather packaging: Ask each student to bring a couple of empty and clean packaging items from home. Ensure you have a variety of packaging from food stuff (e.g. water, milk, tea, cereals, juice, ordered meals), and other common objects (e.g. wet wipes, detergents, toothpaste tubes, personal care products) Besides plastic include other materials, like paper, glass, tin and aluminum. All packaging should be empty, clean and glass should be not broken (avoid glass with younger students).
2. Decode the labels: Each student randomly picks items from a box. Ask them to decodify all the symbols on their packaging. For help they can use the table below or browse on the internet.
3. Each student draws on their notebooks all the symbols of their label/ product and decodifies the meaning of these symbols in a few words.

4. Based on each label, students explain how the product should be disposed. They might be surprised at how many products cannot be recycled, but need to treated as waste (buried or incinerated, depending on country).

Common packaging symbols explained			
	The manufacturer contributes to a packaging recovery scheme. The sign does not refer to recyclability (the item could or could not be recycled).		Product made from aluminum that can be recycled.
	Product can be recycled; the symbol does not indicate that the product has recycled content.		Paper or cardboard, coming from forests that are sustainably managed.
	Product can be recycled. The product also contains ...% recycled material.		Electric and electronic devices which need to be recycled separately; dispose in the dedicated bins/spots.
	Polyethylene (for water bottles, soft drinks, etc.) Can be easily recycled.		Recycle glass in the dedicated bins.
	High Density polyethylene (for detergents, juices & thick garbage bags, etc.). Can be easily recycled.		Products certified to be industrially compostable; must be disposed in the bins for organics.
	Polyvinyl chloride used for cables and piping. It is more difficult to recycle than the rest; if it burns it releases toxic substances.		EU sign for products and services meeting high environmental standards in their entire life-cycle. Needs to be accompanied with the license number.
	Low density polyethylene, for thin bags used in groceries and supermarkets. Its thin texture makes it difficult to recycle.		Don't litter; dispose of the item responsibly.
	Polypropylene used for bottle caps, sauce, take-away and ordered food containers as well as medicine. It is easily recycled.		The material used in the product is considered safe for food contact.
	Polystyrene has a foamy texture and was used in various SUPs. Being difficult to recycle it was banned in Europe, since July 2021.		Product expiration (best-before) date.
	Multi-layered plastics that do not fall into the above categories. They are very difficult to recycle.		The period a product remains suitable for consumption after its opening, indicated in months.

Reflection / Debrief

Discuss how willing students are to be more label-conscious next time they go shopping and how willing they are to change a loved brand in favor of one with a more green packaging.

Websites to learn more

More symbols explained: https://www.swedbrand-group.com/blog/packaging-symbols-explained/

https://www.sciencehistory.org/the-history-and-future-of-plastics

https://ed.ted.com/lessons/what-really-happens-to-the-plastic-you-throw-away-emma-bryce

5) Properties of plastics

Plastic is a wonderful, versatile, cheap and easy to make material! What are the characteristics of plastics that have enabled them to conquer the planet in just a few decades? When do these properties turn an otherwise advantage to a disadvantage?

Learning objectives

To discuss the properties of plastics
To be aware of how an advantage turns to disadvantage when it comes to SUPs

Estimated Duration

30 min (class activity)
30 min (discussion with the elderly)

Materials & Equipment

An old / vintage object made of plastic or other material and a modern one for the same use, Notebooks, pens, pencils, (optional) photocopies of the table

Key Facts / Useful Information

Did you know that the word plastic originates from the Greek word 'plastic' meaning capable of being shaped or molded?

All aspects of our modern life involve plastics in various forms, with diverse applications from transparent membranes to bullet-proof vests. We use plastics in numerous products across every industry i.e. construction, transportation, electronics, clothing, healthcare, and agriculture. Plastics are lightweight, strong, cheap, and easily take different shapes and colors.

These properties rendered plastics suitable for Single-Use Plastic (SUP) items, such as straws, food and beverage packaging, cups, plates and cutlery. SUPs are, by design, short-life items, meant to be quickly discarded as trash, causing irreversible damage to marine life, birds and ecosystems. The ubiquity of SUPs and the inappropriate or inadequate waste management are posing significant risks to the environment, health and society.

PROPERTIES	(+) ADVANTAGE	(-) DISADVANTAGE (RISKS)
They are lightweight.	Ideal for transport, making cars, airplanes etc.	If not disposed of properly, they can spread everywhere by the winds, currents, etc.
They are long lasting, durable.	Stable for many uses e.g. constructions, etc.	If they end up in the natural environment they pose a risk to wildlife for decades or centuries.
They have a low production cost.	Affordable for massive production and consumption.	Because they are cheap they are used as SUPs. This overconsumption leads to amounts of waste beyond limits that can be processed.
They are easy to mold, bend and color.	Numerous applications and products are plastic.	It is impossible to recycle massively the hundreds of types (codes) of polymers that exist out there.

Process Step-by-Step

1. WARM-UP: Bring to class a 'first generation plastic' (e.g. a Bakelite cup) or an object made from another material, e.g. a metal water flask, an ivory comb, etc. as well as a modern plastic product for the same use and ask students to trace similarities and differences.

2. Present to the class the above table. Discuss with the students about the properties of plastics, in general and how some advantages can turn to disadvantages, if an item is not used / transported / discarded properly.

3. Invite students to each think of a plastic object they use frequently and consider its advantages (e.g. appealing, easy-to-use, cheap, light); duration, disposal, and the possible risks if the object is mistreated /lost / broken. Students should fill in the following card.

4. Students, in pairs, discuss and compare their notes on advantages and risks of their objects.

My object	How long I use it	How I dispose it .....
Object's properties / advantages	Object's disadvantages / risks	

Reflection / Debrief

Discuss with the students what surprised / impressed them in the activity. Any ideas for changes in their everyday habits?

Extension

Have you ever thought how a person lived in the 50's and 60's without so much plastic in their lives? Invite the students to talk to older people (grandparents, neighbours) about items that are now made of plastics, but weren't in the past. What were they made of? How did the abundance of plastics change their lives?

Websites to learn more

https://ed.ted.com/lessons/a-brief-history-of-plastic

https://www.sciencemuseum.org.uk/objects-and-stories/chemistry/age-plastic-parkesine-pollution

6) Make your own plastic

In this activity we study Polymers: What are the differences in the way of making these, what are their uses, and which ones can be recycled? We also experiment with making our own plastic (polymer) from milk!

Learning objectives

To get to know the various types of plastics
To experiment with creating a plastic
To manage responsibly their waste

Estimated Duration

60 min

Materials & Equipment

1 cup of milk
4 teaspoons of white vinegar
a pan, a strainer, a heat-resistant bowl
coffee filter and paper towel

Key Facts / Useful Information

Plastics is a family of materials called polymers. Polymers are made up of monomers repeating in long chains. The repeating parts can be the same molecule, or chains of different types of molecules linked together in a regular pattern.

Plastics are classified into three categories according to their physical properties:

- Elastomers These are flexible plastics: they stretch under pressure and then return to their original shape. Examples include natural rubber, silicone, and neoprene. These types of plastics are commonly used in tires, rubber bands, baby pacifiers, belts, prosthetics, etc.
- Thermoplastics: As polymers, they have linear or slightly branched long chain molecules. These plastics soften when heated and harden (return to original form) once cooled. That is why they can be easily recycled. Examples include Polyethylene PE, Polypropylene (PP), Polystyrene (PS), polyvinylchlorides (PVCs), etc.
- Thermosets: As polymers they have many cross-links and heavily branched monomers. These plastics are heat-hardened into a permanent design. Once they have been shaped, thermosets remain in a fixed form; even if reheated they don't melt. That is why they can't be recycled. Due to their durability and temperature-resistance, they are used in electric appliances, insulators, lights, floors, etc. Examples include Bakelite, epoxies, polyurethane, silicone (that is also an elastomer), etc.

Process Step-by-Step

A. WARM UP: Ask students to guess how many types of plastics exist (Answer: thousands!). Present to class the table of the 7 most common types of plastic in packaging (ANNEX 1). Ask if they ever noticed the three-arrowed triangle in packaging. Stress that the numbers 1-7 refer to the types of plastic (polymer), while the triangle does not indicate recyclability (some polymers can be recycled, some can't).

B. EXPERIMENT: Students work in pairs or small groups in the lab to create their own polymer from milk! They are handed out the following instructions:

1. Heat a cup of milk in a pan until the milk is steaming but not boiling.
2. Add the hot milk to a heat-resistant bowl.
3. Add 4 teaspoons of white vinegar in the bowl and stir. Continue stirring for a few seconds. Small white chunks should start to form.
4. Once the milk and vinegar mixture has cooled a bit, pour the mix through a strainer with a coffee filter to remove the liquid part.
5. Squeeze the curds between two paper towels to soak up the extra liquid.
6. Knead the curds together in a ball. This is your casein-plastic! Make your casein-plastic sculpture, jewelry or toy using a mold, or a cookie-cutter.
7. Discard any unused curds in the trash bin, don't pour them down the sink.
8. Leave the creation to dry on a paper towel for 48 hours. Once dried, the casein plastic gets hard.
9. Once dried, paint your creation with water color or markers (avoid glitter, it contains microplastics).

Reflection / Debrief

Explain the chemistry behind the experiment: Milk contains a protein called casein (actually casein is already a polymer with amino acids as monomers). When milk is heated and combined with an acid (vinegar), the pH drops and the casein molecules (monomers) unfold and reorganize to form a long chain (polymer), thus curdling the milk.

Extension

Older students survey the following within their chemistry class:

- Is casein plastic a thermoplastic or thermoset? How would you check?
- Is your plastic synthetic or bio-based?
- Is your plastic biodegradable?

Websites to learn more

Thermoplastics vs. Thermosetting Polymers: Properties, Processing and Applications: https://matmatch.com/learn/material/thermoplastics-vs-thermosetting-polymers

Plastics & recyclability: https://ourworldindata.org/uploads/2018/07/Plastics-by-polymer-type-01.png

Hands-on Science Resource: https://www.sciencebuddies.org/stem-activities/milk-into-plastic

UNEP 2015, Biodegradable Plastics & Marine Litter https://wedocs.unep.org/20.500.11822/7468

7) Make something wearable from plastics!

Students are asked to make a wearable item from plastic with the aim to playfully explore the characteristics of different types of plastics. What are the qualities and weaknesses of plastic? And which techniques can be used to bind them together? Let's find out!

Learning objectives
To explore the physical features of plastics
To be creative
To plan, build, test and evaluate one's own creations

Estimated Duration
60 min

Materials / Equipment
As many as possible different kinds of plastics and Single Use Plastics you can find (See Step 1), Saw & vice; a needle; iron; wire cutter; a pair of scissors; hot glue gun

Key Facts
Did you know that plastic was invented in 1907?
Did you know that plastics made the life of people from 1950s much easier?

Process step-by-step
For a period of one week ask students to bring from home different kinds of (Single-Use) Plastics. Examples: Imitation leather; Polypropylene (hard plastic) from yogurt containers and take away or ordered food, PET bottles and lids; PVC pipes; ironing beats; plastic straws; old plastic kitchen gloves and tools; old plastic toys; bubble wrap; thin plastics used as packaging in purchased items (from TVs to toys, most objects come wrapped in plastic); plasticized sheets or old plastic folders no longer in use; nylon thread; plastic washing line; plastic clothespin; tie rips; old shoe laces; clean old pots, old markers, etc.

Room setup: Put all the collected materials on two tables, one in the front and one in the back of the classroom, so, pupils need to walk around to get these. This encourages them to look at the products of peers. Make a workspace for the use of tools.

Give a short introduction to the assignment: "Make something you can wear from plastics. It doesn't need to be clothes, but it can be!" It is very important that pupils work safely. Give these special instructions and make clear where and how they can ask for assistance with the different tools. Make the introduction light and cheerful. This assignment is about creativity, pleasure and exploration in the process of making a wearable item, not about the result.

Tip for teachers!

For facilitation techniques to spark initial interest, to sustain participation and to deepen understanding of pupils check the **Facilitation guide from the Tinkering Studio of the Exploratorium** (or ANNEX 2).

Coaching: Suppress your urge to intervene or help in solving the problems of the pupils. Instead, praise their ideas and encourage them to try something they come up with. Focus on the process and make compliments about that, for example: “What a clever way to lash that together!” or “How great that you persevered!”

Pupils’ learning: Let the pupils learn from their activities, their mistakes and their successes. Did they do something for the first time? Or do they need an extra challenge?

Clean up: To end the activity pupils should clean up their workspace and put all the unused materials back to the materials tables.

Debrief

Ask every group a different reflection question about their process: What are you proud of? What was difficult? What was easy? What did you learn? What was frustrating? Who was better in which skill? What should you have handled differently?

Websites to explore more

https://www.exploratorium.edu/education/tinkering-projects

8) Plastic Museum Curator

After studying the types, characteristics and uses of plastics, students can become curators in a hypothetic museum of plastics. What objects would they pick for their exhibition and why? What would be their underlying narrative connecting these objects?

Learning objectives

To reflect on the role of plastics in modern life
To practice analytical, creative, and synthetic thinking
To practice in organizing content and making connections
To practice presentation and communication skills for a collection.

Estimated Duration

At least two 30 min sessions

Key Facts / The history of plastic

Plastics were first created in the late 19th and early 20th centuries. **Celluloid** was one of the 'first generation plastics'. Such plastics could be used to replace items made from scarce natural resources such as horn, ivory and tortoiseshell. Prior to plastics, the widespread use of ivory (for products ranging from billiard balls, to combs and piano keys) placed a huge pressure on elephant populations. The invention of **Bakelite** (1907), was revolutionary with its plasticity, strength, low electrical conductivity, heat and water resistance. It was used for the new products of that period, such as radio and telephone. Plastics' use increased to cover the needs of World War II, while their mass production started around the 1950s. Since then, plastics have gradually replaced all traditional materials such as wood, metal, cotton, glass and cardboard in the household and beyond.

Materials & Equipment

Various plastic objects

Process Step-by-Step

1. WARM-UP: Ask students about any collections they might keep e.g. of toys, stickers, cards, sea shells, leaves, comics, etc. What is special about their collection? Who do they share it with? How? Why do they collect?
2. Brainstorm: If they were to create a collection of plastic objects to be seen by a visitor in 2500, which item would each student choose and why? How often do they use it? How is it important? What is the story behind? Will the functionality of the object be relevant in 500 years from now, or will the

Objects' ID	
Object name:	Picture / sketch
Description (size, colors, shape)	
Uses / function:	
Date of production:	
Collector:	

plastic object appear as rare, exotic or vintage in the eyes of the future visitor? What is the role of plastic in 2500?

3. Give students time to choose and present their items. They can write and draw on the "ID card" of their object.
4. In your second meeting discuss ways to present and communicate the collection. There are many ways of sorting the objects (e.g. by shape, color, use, etc.) and many ways to connect them in an interesting story: For example, the whole collection could be curated under the topic "Leisure activities in the beginning of the 21st century". Students negotiate and decide how they will group their objects, and create an interesting "pathway" for the visitor.
5. Set up the exhibition: Dedicate a space in the classroom / school for your collection. The exhibition can be a work-in-progress project, open for additions, updates, etc.
6. FOLLOW-UP: Students think of ways to communicate the collection to the whole school and the local community. For example, they could write the labels for each item, and invitations to present the "narrative" behind their exhibition.

Reflection / Debrief

Discuss with the students about their thoughts and feelings throughout the process.

- How difficult/easy they experienced the process;
- What surprised them;
- What made them proud/satisfied;
- What did they wish to convey to younger students or friends from this experience?

Websites to learn more

British Council Creative Commissions Programme, A future where single use plastic is only ever found in museums, Virtual Museum of Plastic (online game): https://cura.tours/mop2121/

Photo collection in the UK Science Museum Group/Filter by "plastic"
https://collection.sciencemuseumgroup.org.uk/

9) Bin auditors at school

Students investigate the operation of the waste and recycling bins throughout the school premises, in order to come up with suggestions for possible improvements in the overall waste management.

Learning objectives

To practice mapping skills
To practice Enquiry Based Learning
To understand solid waste management

Estimated Duration

Two 45 min sessions

Materials & Equipment

Kitchen gloves (brought from home, for those who open the bins' lids), notebooks, pencils, cameras, 3-4 floor plans of the school grounds.

Key Facts / Useful Information

TIP: Trash can be gross, so how do we convince students to get involved? While it can be gross, it's important for all of us to have an honest perspective of what goes to landfill. If we reduce our food waste and properly compost it, then trash wouldn't be so gross! Also, when plastic, metal and glass are landfilled due to our negligence and indifference, we lose valuable resources that could have been recycled to new products.

Process Step-by-Step

1. WARM-UP: Ask students who is responsible for the waste management within school. Answers like the municipality, cleaning service or a caretaker, are expected. However, we stress that as users of the premise we are all responsible for the cleanliness of the space where we spend half our day.
2. We present the scope of the activity. Indicative questions to drive our discussion:
    a. How many types of bins are there in the school premises (e.g. for paper, batteries, compost etc.)?
    b. Where are these bins and why were they placed there?
    c. What is the bins' condition? How often are they emptied? Who is responsible? Do we throw 'wrong' things in the trash bins?
    d. How is the school waste management and recycling system linked to that of the municipality? (Link to the survey in the Municipal Solid Waste Management System of Act. 2)
    e. Why is it important to reduce the amount of waste at school / home / town level?
3. Divide the students in groups (e.g. by bin type), hand out the gloves and one floor plan per group and give them time for a mini field research. (In case of a big campus you can limit the area surveyed). The teacher or one student per group, voluntarily and wearing kitchen gloves, undertakes to open the bins' lids. Attention: We will not stir nor touch the

bin contents, we will only observe and take photos of the interior. Groups mark bins on their floor plans, and take notes and photos of "mistakes" in using the bins (e.g. plastics misplaced in the waste bin; overloaded binsq contaminated recycling bins, etc.), and whatever else strikes as noteworthy e.g. litter in the yard, unattended storm drains etc.

Adjustment for younger students: Pupils in small groups (2 to 4) adopt a recycling bin within the school. They find out how the bin is used how often it is emptied, which items it accepts, how to stimulate the use of the bin (arrows, make it stand out, etc.).

4. Back in the classroom we discuss our findings and all the malfunctions detected. We make a list of identified problems. Attention! Students can be quite critical, but we make sure to stigmatize the act and not the persons.
5. A second 45-minute session is dedicated to 'solutions'. Depending on the problems detected, students can suggest action to drive solutions: For example, if they find misplaced waste in the bins, they may suggest improving the bins' signs, talking to the cleaner or the administration or their entire school. Other possible remedy actions can be to start composting, establish a sorting station in class, move the bins closer to waste-hotspots, design a campus-wide event, etc. The more responsibility students have in finding solutions the more creative they will be, and the more committed in implementing their own suggestions.

Design thinking: This methodology can be useful especially in the step of identifying solutions.

6. FOLLOW-UP: Re-run the audit from time to time (e.g. once a month) to check if the solutions you applied tackle the problem and improve the overall waste management.

Reflection / Debrief

Discuss the meaning of the phrase "there is no away" when it comes to waste, especially plastic.

Extension

Organise a visit to the nearest Recycling or Waste Management Facility.

Waste management varies from town to town, so it is recommended that students visit their nearest Recycling or Waste Management Facility to get a first-hand experience of local peculiarities, successes but also difficulties and challenges. In addition, they will realise that there is no away and appreciate the effort and investment required to keep our environment clean.

Websites to learn more

EU municipal waste statistics: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Municipal_waste_statistics

10) Microplastic hunters

Students living close to the sea or another water-body do a field survey looking for microplastics. They also investigate hygiene products at home, learn to recognise microplastics among their ingredients and think of ways to avoid them.

Learning objectives

To practice STEAM skills (observation, field survey, math etc.)
To realise that microplastics are everywhere

Estimated Duration

Outdoor Microplastics: 15 min introduction, 60 min field activity, 30 min sup up
Indoor Microplastics: 15 min introduction, 60 min home research, 30 min sum up

Materials & Equipment

Outdoor Microplastics: Some sieves, jars for the collection, notebooks, pencils, cameras

Key Facts / Useful Information

When plastics are left exposed to the natural elements, over time they start to disintegrate. With the help of the sun, wind, rain and waves plastics fragment into smaller and smaller pieces, microplastics (smaller than 5 mm). Pellets, known also as "mermaids' tears", is the raw material to manufacture all plastic products, and is also a microplastic. Sadly, today both fragmented microplastics and pellets are commonly found in lakes, rivers and seas across the globe and they are digested by organisms.

Sources of Microplastics:

Large plastic items in fragmentation;

Cosmetics with microbeads;

Synthetic fabrics e.g. Polyester (when washed, microfibers are released);

Pellets (e.g. from accidents during their transportation or manufacture);

Car tires (fibers are released every time we brake).

Hunting microplastics outdoors / TIPs for teachers:

- While today microplastics are traceable on almost all beaches, it is easier for students to observe and collect them in sandy ones.
- If your school is far from a beach you can carry out the activity along the banks of a river, lake or stream. Visit the spot in advance to ensure there are microplastics.
- Have handy an actual sample of microplastics in decay and pellets so that students can recognise them.

Today, more than 500 substances, widely used in cosmetics & personal care products are characterized as microplastics. The most common ones are Polyethylene (PE), Polypropylene (PP), Polymethyl methacrylate (PMMA), Nylon (PA), Polyurethane, and Acrylates Copolymer.

Process Step-by-Step

1. WARM UP: Ask students if they have ever heard the term microplastics: Even if they haven't heard it maybe they can guess by the name, what it could mean. Write on the white-board a mind-map and eventual questions of students on microplastics.
2. Watch any of the proposed videos that explain how microplastics form and what is their fate in the environment.
3. **Hunting Microplastics Outdoors**: Visit a beach and trace the winter shoreline (a line that is parallel to the waterfront where seaweed, wood branches, etc. tend to pile up, due to winter waves). Set the stretch of the shoreline area to be investigated, e.g. from 10 to 20 meters using a long rope or by counting steps. Along this line and with the help of the sieves students collect samples of a) fragmented microplastics and b) pellets. If they are not sure about some of their samples they can check them under a stereoscope when back in school.

   Alternative activity for schools far from a beach: With the help of an adult students check the laundry machine filter or the bags used to catch the fibers of polyester clothes.
4. Back in class, sum up the quantity of the microplastics collected. Make the math calculations to estimate how much microplastics are expected e.g. for the entire beach, or per Km of beach in your area.
5. **Hunting Microplastics Indoors**: Ask students to look for microplastics in the labels of personal hygiene products at home. Because plastics are mainly Polymers (see Activity 5) they are usually named as "Poly ...". You might be surprised as to how many of these are contained in products like toothpaste, scrubs, mascaras, shampoos, but also glitter drawing markers, synthetic clothes, etc. Each student should make a list of Polymers:

Type of product (e.g. toothpaste)	Brand	Polymer's Acronym	Polymers' Full name	Alternative

6. Back in class, discuss your findings and suggest alternative products you could start using (last column of the above table).
7. FOLLOW UP: Consider joining the "Dare to Care Campaign" and write a letter to your favorite cosmetics brand, asking them to stop using microbeads in their products.

Websites to learn more

Videos on Microplastics by a) TEDed (2014) www.youtube.com/watch?v=KpVpJsDjWj8 b) Encyclopedia Britannica (2019), www.britannica.com/video/185601/problem-oceans-Earth-particles

Beat the Microbead. We learn which cosmetics brands in our country do (not) use microplastics www.beatthemicrobead.org/ and how to recognize them www.beatthemicrobead.org/guide-to-microplastics/

11) Zero plastic days

Students are encouraged to spend some days while minimizing "Single Use Plastics" (SUPs). They note their progress in a diary and discover how creative and resilient one has to be to live a plastic free lifestyle today.

Learning objectives

To realize how plasticized our lives have become
To recognise SUPs as synonymous to convenience
To practice creative thinking

Estimated Duration

From 1 day to 1 week

Materials & Equipment

Notebooks, pencils, cameras

Key Facts / Useful Information

Plastic has invaded our lives to a point where living without it can be quite hard; especially Single Use Plastics (SUPs) have been established as a synonym of convenience. However, there are some disturbing facts about plastics:

- Since the 1950s, the production of plastic has outpaced that of any other material.
- Plastic lasts for centuries. It is estimated that a plastic bottle takes 450 years to decompose in nature, depending on where it is (buried, in sea, or in open air).
- Almost all the plastic that was ever made still exists today - a small part of it has been incinerated or recycled.
- Plastic production increased geometrically in the last years and is expected to keep doing so. From the total production 36% is meant to be used only once, as packaging.
- Even if plastic production escalates, globally, only 9% of it is recycled today.
- About half of litter found in Europe's seas and coasts is SUPs.

Here are some ideas for a plastic free household:

- Opt for family size and refillable packaging instead of individual small portions.
- Choose unpackaged fresh food and vegetables instead of packaged.
- Packaging made of pure uncolored plastic (e.g. PET) is better than multi-layered materials (e.g. tetrapac) or colored plastic, for the recycling factories.
- Choose freshly squeezed juice served in a glass without a straw instead of bottled one.
- Opt for reusable shopping bags (or no bags) instead of thin plastic ones.
- Avoid bottled water if you can have clean tap water.
- Opt for returnable glass bottle instead of PET (for water tap is always the best choice).
- 'Bring your own mug' for take-away drinks from the cafeteria.
- Avoid straws entirely or, if necessary, carry with you a reusable one.
- Choose a bamboo toothbrush instead of a plastic and make your own toothpaste.
- Buy legumes in bulk packaged in a paper bag or a 'brought from home' container.

Process Step-by-Step

1. WARM-UP: Start with sharing some facts, or give students time to browse and discover what is Single-Use-Plastic (SUP) and an interesting fact about it.

2. Give pupils time to note every SUP item they use in one day and consider possible alternatives to them. Alternatively do this step by asking students to create comics of daily habits that are either plastic-consuming, or plastic-free.

3. Propose to the class to hold a "Zero Plastic" challenge for one or more days. We will need good planning, creativity and changes in the way we do our shopping, so that we don't make compromises in our quality of life nor be deprived of something essential. Keep in mind that, to minimize SUPs will entail some disruption in our convenience e.g. reducing our packaged snacks, ordered food (packaged) and even online purchases mailed to us.

4. Ask students to keep in a diary every little change, every little victory achieved, but also the times when they did not resist or did not find an alternative to plastic. This is to a degree expected due to the dominance of SUPs and the convenience they offer us.

Reflection / Debrief

At the end of the challenge discuss the experiences as depicted in our diaries, the reasons behind each of our "victories" and "defeats" against SUPs. We may decide to adopt one or more of our new habits on a permanent basis.

Extension

We organise a 'Buy Nothing Day' as a school, or join the global campaign.

TIP for teachers: We participate in the challenge and honestly communicate our own wins and defeats. In any case, we avoid patronizing the less eager ones: We don't all have the same starting point, neither the same will for change, nor the same support at home. So, we welcome any small change that a student adopts, and we make sure to set an example from our own lives, by using as few SUPs as possible.

Websites to learn more

UNEP-IETC, 2018: Single Use plastics a Road Map to Sustainability
https://wedocs.unep.org/bitstream/handle/20.500.11822/25523/singleUsePlastic_sustainability_factsheet_EN.pdf?sequence=1&isAllowed=y

EU Commission Staff Working Document, Impact Assessment, Reducing Marine Litter: action on single use plastics and fishing gear, 2018 https://op.europa.eu/en/publication-detail/-/publication/4d0542a2-6256-11e8-ab9c-01aa75ed71a1

She tried to avoid plastic while grocery shopping for a week. Here's how it went
https://www.npr.org/sections/health-shots/2022/07/02/1109498551/she-tried-to-avoid-plastic-while-grocery-shopping-for-a-week-heres-how-it-went

12) The Rs of Sustainability

Since the 1970s many environmental projects have been based on the 3Rs (Reduce-Reuse-Recycle) and with time several other "R verbs" have been added, such as Refuse, Repair, but also Rethink. Students think of, prioritize and commit to several actions representing these Rs.

Learning objectives

To be familiarised with the various Rs approach.
To reflect on how they can contribute to tackle plastic pollution.

Estimated Duration

45 minutes

Materials & Equipment

Notebooks, pens, copies of the table, large post-it papers

Key Facts

Recent research shows that people are motivated by their environmental concern, ability and task-specific benefits when "greening" a habit. On the other hand, lack of knowledge and opportunities, inconvenience, and difficulty are de-motivating factors.

The "Rs of sustainability" demonstrate how we can curb the linear consumption processes and reduce our waste, by making informed and responsible choices in our daily lives:

- **Refuse**! Don't buy, nor support products or companies that harm people, animals or the environment, like the single-use plastics products.
- **Reduce!** Let's limit our plastic consumption overall. Do we really need all the things we consume? Let's see how we can reduce our energy and water footprint too.
- **Reuse!** Be creative with how we can extend the life of products. Opt for reusable items e.g. multiple uses bags/bottles/cups, rechargeable batteries, etc. Donate old clothes.
- **Repair and repurpose!** Can we fix things? Can we repurpose, upcycle objects?
- **Recycle!** Do we know how to recycle properly? Do we separate plastic, paper, metal, glass, organic, etc.? Recycling is an option; however not all things put in the bin will end up being recycled e.g. due to their poor quality, plastic-type or bin contamination. We should remember that plastic recycling has an important energy and water footprint.
- **Rethink** is a horizontal act permeating all the above! How do we view the natural world and its resources? Do we produce and consume too many products? Do we believe that our daily choices can make a difference?

Process Step-by-Step

1. Give some time to the students to consider how they dispose of the objects of the table (they can add more items). Invite them to be sincere on what they actually do by ticking ✓ on the proper box.

2. Students share their responses through a 'Think-Pair-Share 'exercise. Their replies should not be judged or criticized.

	Refuse- **R**eplace with…	**R**educe	**R**epair- **R**euse- **R**epurpose	**R**ecycle	*Any comment?*
PET Water bottle					
Food wrapping for school snack					
Straw					
Soda plastic bottle					
Balloons					
Old broken toys					
Thin plastic bag					
Antiseptic wipes					
Old markers and pens					

4. Present a list of R-verbs for sustainability in post-it papers and ask students to add other R-verbs to the list (e.g. re-gift, re-fill, etc.) Brainstorm to prioritize the verbs from the most to the least impactful for the sake of our environment.

5. Take a photo of the resulting hierarchy: Even if there are no clear boundaries, some verbs are 'greener' than others. For example, 'refuse' should be ranked higher than 'reduce' or 'recycle'. `

6. After the prioritisation, ask students whether they are willing to change their replies noted the table, as a pledge / commitment from now on. Which ones?

Reflection / Debrief

Discuss with the students the following:

- Why is it sometimes hard to change habits?
- How could we engage our families / friends / school in applying the Rs discussed?

Extension

Make a school book or magazine devoted to the R-verbs. Students work in pairs to prepare articles, interviews, stories poems, songs, advertisements. You can communicate your magazine in printed or e-form to parents, your schoolmates and the school's website.

Websites to learn more

The Three Rs: Order is Important: https://sustainability.uconn.edu/2020/04/07/the-three-rs-order-is-important/

TrashHack Platform and Campaign www.trashhack.org

13) Plastic Free School Feasts

On the occasion of an upcoming school feast or a party, in which a lot of people are expected and snacks will be offered, we organize it without disposable plastics (SUPs). Where do we find supplies? How do we do zero-plastic decoration? Who should we inform to support us?

Learning objectives

To re-think our consumption during parties

Estimated Duration

Two 30 min sessions, before and after the feast

Materials & Equipment

Notebooks, pencils, cameras

Process Step-by-Step

1) WARM UP: In view of the upcoming school feast or party, ask the students to help in the preparation. Ask them "What supplies will we need for the organization?" and list their ideas on the whiteboard without commenting. Students are likely to mention, among others, decorations, flags, balloons, confetti, crockery for snacks, souvenirs and other products that will be thrown away immediately after use.
2) When the list is done, explain that feasts, parties and festivals in general have a high environmental footprint because of their resulting waste (both plastic and food).
3) Ask students to estimate the amount of waste of their planned feast, according to what they have suggested. If they consider the feast will be too wasteful, they can make suggestions to reduce the footprint. We then redesign the feast and the purchase list, trying to be more environmentally friendly, and, above all, without SUPs.

Find on the internet ideas for zero-waste or zero-plastic parties. Here are some tips:

- We inform the school management and the canteen personnel about our intention to organize a green event and ask for their support.
- We say no to "Single-Use" items in general, not only plastics (e.g. instead of paper straws we opt for no straws, instead of bamboo crockery we prefer reusable from Bakelite, or ceramics etc.
- We choose healthy snacks that we get in bulk from a bakery or we ask the parents to prepare something at home. Usually finger-food is less wasteful.
- We avoid printing, we send invitations electronically and we inform the guests in advance that this is a SUP-free event.
- We say no to balloons.
- We say no to glitter markers.
- We make our own decoration, hats & wrapping papers by painting on old newspapers, comics and cardboard.
- We say no to plastic gifts, we prefer durable gifts like books, comics, notebooks, crayons, or we make our hand-made gifts from plastic bottles, etc.

4) During the feast we ask the participants to support us in the effort to organize it with a minimum plastic footprint.
5) At the end of the feast we take part in the picking and washing the dishes and the cleaning of the space, so that we leave it as we found it.
6) We make sure that food waste goes to pets or to a compost bin. Of course, if there is untouched leftover food, we share it with our families.

Debrief / Follow up

After the event we discuss students' impressions on the amount of garbage created. Reaching zero waste will take repeated efforts, the key is to do something each time and keep improving from one event to the next. Finally, we discuss with the students which of these practices they would like to keep also in their personal birthday parties, from now on.

14) Sustainability at school from A to Z

Students are asked to create a sustainability alphabet for their school. For every letter they think / write/ draw of a concrete action they can do, from now on, for a school that not only consumes less plastic, but is greener, in terms of waste disposal, energy and water consumption, is more open, more inclusive etc.

Learning objectives

To practice creative thinking
To consider the school and its people as an entity

Estimated Duration

45 min

Materials & Equipment

Notebooks, pencils, a big sheet of paper or cardboard, crayons for drawing

Process Step-by-Step

1. We start with a brainstorm on the concept of sustainability and note down students' ideas in key words. Attention! Sustainability is not restricted to environmental issues but embraces also societal and economic aspects, such as equity, justice, fairness in economic development, etc.
2. Discuss: How could the sustainability principles could be applied at the level of our school. What are the elements of an ideal "sustainable school"? Students keep noting key-words.
3. We ask students to depict these aspects as commitments in the form of an alphabet. For every letter they should think / write/ draw of a concrete action they can do, from now on, to make their school more sustainable (e.g. **A**dopt the nearby park, to make sure it is waste-free, **P**lant the school garden, etc.).
4. They communicate their Sustainability Alphabet in a poster hanged in the classroom or the school corridor. Alternatively, this could take the form of a hand-made garland.

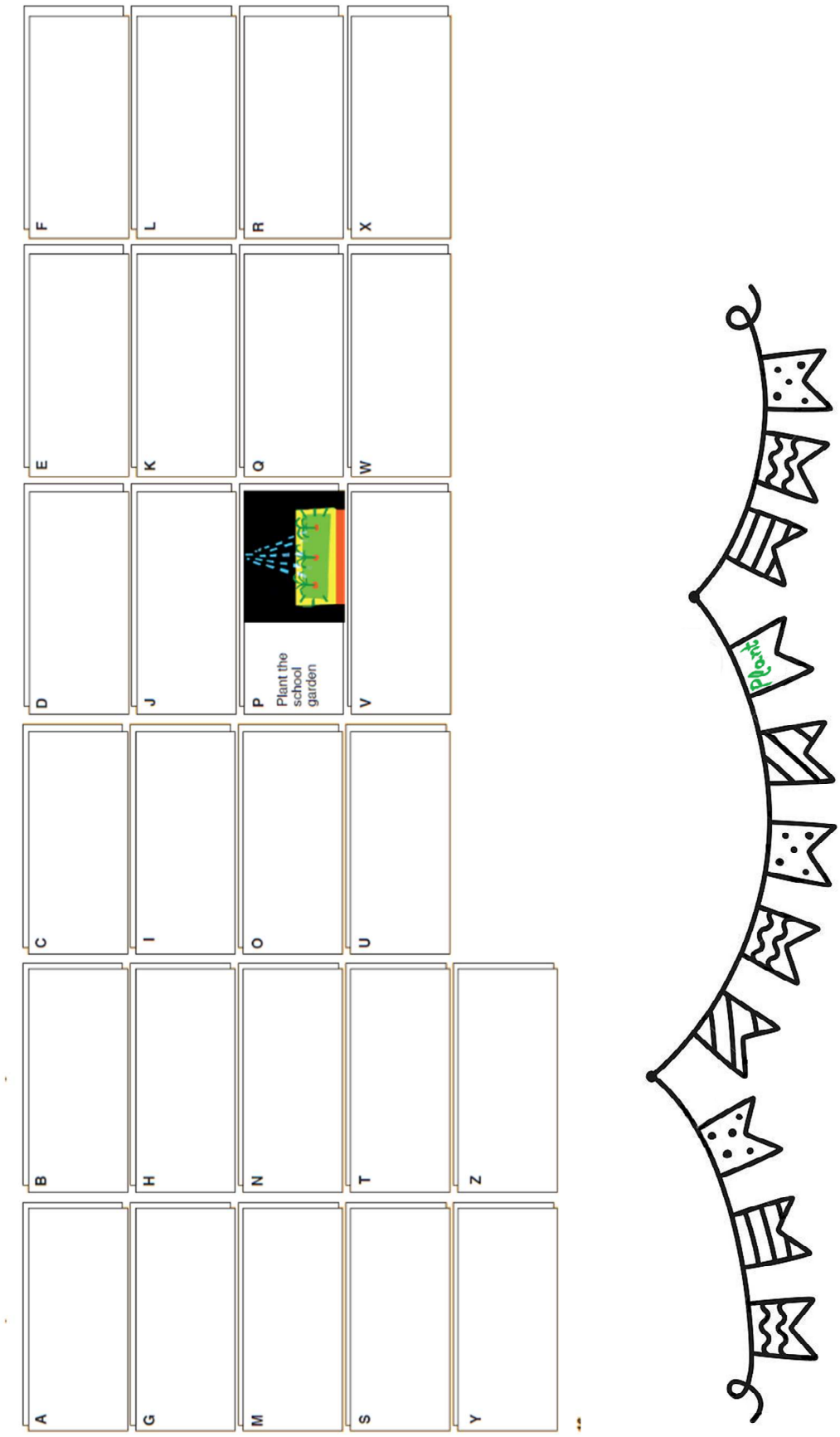
Debrief

Can you commit as a class to keep doing these actions from now on? How could you convince your less enthusiastic friends and the not so eager adults?

Websites to learn more

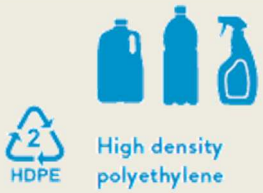
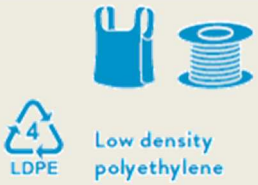
Worlds' largest Lesson on the SDGs: https://worldslargestlesson.globalgoals.org/
Design for Change: www.dfcworld.com
Global game changers: https://globalgamechangers.org

Example of an empty “commitment” poster or garland for a Sustainable class / school:



Annex 1 – Types of Plastic

The table summarizes the seven types most widely used in packaging (and elsewhere) and their capacity to be recycled.

	Polyethylene terephthalate (PET) for water bottles, soda bottles, food containers, etc. Easily recycled.
	High Density Polyethylene (HDPE) for water bottles, soda bottles, food containers, etc. Easily recycled.
	Low density polyethylene for frozen food bags, food wrapping, plastic bags, six-pack rings. Hard to recycle.
	Polypropylene for dishware, medicine bottles, bottle caps, yoghurt cups, food packaging for take-aways and ordered food. Recyclable.
	PVC for wire insulation and pipes. Very difficult to recycle.
	Polystyrene for food take-aways, cutlery, drinking cups. Very difficult to recycle. Banned in EU since 2021
	Multilayered plastics that do not fall in the above categories. Very difficult to recycle, due to the diversity of materials it includes.

Annex 2 - Facilitation guide

Facilitation guide from the Tinkering Studio of the Exploratorium.