

UpCycling:
STEAM
EDUCATIONAL
ACTIVITIES

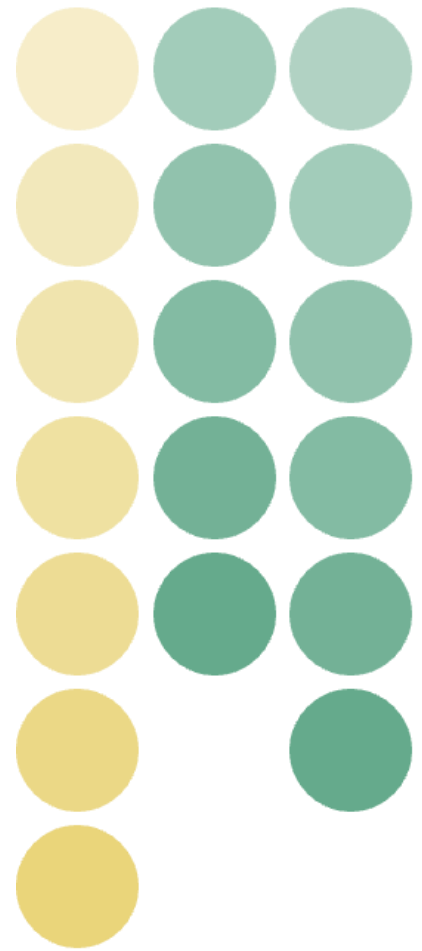




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PREFACE

Welcome to the Upcycling and STEAM educational activities compilation. This document is an integral part of the Erasmus+ project "Upcycling as a way to generate less waste and create value-added products in a creative way" (project number: 2021-1-IS01-KA220-SCH-0024011). It serves as a resource for educators as part of the course "Upcycling: The importance of Upcycling – Course of educators".

The compilation includes 16 activities that are tailored to primary and secondary education and are based on the 8 modules of the Upcycling: THE IMPORTANCE OF UPCYCLING - COURSE FOR EDUCATORS. These activities are categorised according to UNESCO's International Standard Classification of Education (ISCED): ISCED 1 for primary education, ISCED 2 for lower secondary education and ISCED 3 for upper secondary education.

The main aim of this resource is to support educators in implementing upcycling principles and the STEAM approach in the classroom. In particular, the activities are designed to complement the course content, promote environmental awareness and boost students' motivation, creativity and entrepreneurial spirit.

We thank you for your commitment to sustainable education. We hope this resource will serve as a practical guide for promoting upcycling and STEAM principles in your classroom.





1. ENVIRONMENTAL CHALLENGES

Activity 1: Real-life problem solving: Environmental challenges in our neighborhood/community/country

Activity number 1	
Name of the activity	Real-life problem solving: Environmental challenges in our neighborhood/community/country
Introduction of the topic/	Becoming familiar with the main environmental challenges is an important aspect of being able to contribute towards a more sustainable future and help protect the environment. Furthermore, being able to identify the environmental issues that stand nearest to yourself and your community. In this activity, a real-life problem solving exercise , learners will learn about and become aware of different environmental challenges their community/country/city/town is facing. Learners will reason and think creatively to come up with potential answers to the issue by creating ways to solve the problem. Additionally, learners will assess the feasibility of their proposed solutions and discuss how they can work together with their community to implement them.
Age group/Level	ISCED 2 = Lower Secondary Education ISCED 3 = Upper Secondary Education
Learning objectives	<ul style="list-style-type: none"> ● Learners will become aware of local environmental challenges. ● Learners improve their capacity for critical thinking and problem-solving skills. ● Encourage learners to take action to preserve the environment and do their part to tackle local environmental issues.
Materials	<ul style="list-style-type: none"> ● Whiteboard or chart paper ● Markers

	<ul style="list-style-type: none"> • Handouts with information about environmental challenges in their community • Paper and pencils • Equipment that learners need to complete their project based on the approach chosen by each group: computer, camera, tablet, arts and crafts tools...
Grouping and/or interaction	Groups of 4-5

<p>How to - Description</p> <p>Execution</p>	<p>Introduction: Begin the activity by discussing with learners about the importance of preserving the environment and the impact of human activities on the planet. Provide handouts with information about the environmental challenges in your community such as air pollution, water pollution, waste management, deforestation, and climate change.</p> <p>Brainstorming: Divide learners into groups of 4-5 and assign each group one of the environmental challenges from the handouts. Ask them to brainstorm and write down ideas of practical solutions to address the challenge on a whiteboard or chart paper. Encourage them to think creatively and come up with innovative ideas.</p> <p>Presentation: After 30 minutes, ask each group to present their ideas to the rest of the class. Allow other groups to ask questions and provide feedback.</p> <p>Main project: Ask each group to choose one solution from their list and develop an action and promotion plan to implement it in the school or the community. Allow each group to choose their medium for their project/campaign. Each group must think of strategies to promote their action plan. Example: Group 1 decides to make a short film about e-waste in their community in order to promote recycling or upcycling of that waste. Other examples: Stop-motion film, webpage, art installation, prototypes...</p>
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The teacher gives the learners the time he deems appropriate and suits the learners' or the class schedule to prepare their project.

Conclusion:

Ask each group to present their project to the class. Discuss with the students about the feasibility of the plans and how they can work together to implement them. Encourage them to take action and make a positive impact on the environment.

Assessment: You can assess the learners' performance based on their participation in the brainstorming session, the quality of their solutions, and their ability to create a practical action plan. You can also evaluate their ability to work in a team and their communication skills during the presentation.



Activity 2: I pledge to protect the environment

Activity number 2	
Name of the activity	"I pledge to protect the environment"
Introduction of the topic/	<p>Environmental problems are diverse and affect regions and people around the world to varying degrees. It is important to introduce children to environmental problems in order to make them more aware of them and so they realise that the quality of the earth is not something to be taken for granted. The primary objective of this STEM school activity is to introduce learners to global environmental challenges and help them understand the importance of protecting the environment. This activity gives the learners an opportunity to express their opinion on different environmental problems and raise awareness about them. By the end of this activity, ISCED 1 students will have a basic understanding of general environmental challenges and will be motivated to take small actions to help protect the environment. This activity not only fosters environmental awareness but also encourages teamwork and creativity.</p>
Age group/Level	ISCED 1 = Primary Education
Learning Objectives	<p>For example (at least 2 and max. 4):</p> <ul style="list-style-type: none"> ● Environmental Awareness: Learners will develop an understanding of various environmental challenges, such as pollution, deforestation, and endangered species. ● Collaboration and Teamwork: By working in small groups to create posters, learners will learn to collaborate with their peers, share ideas, and work together toward a common goal. ● Empathy and Responsibility: The activity will promote empathy for the environment and a sense of responsibility for taking care of it.



	<ul style="list-style-type: none"> ● Action-Oriented Learning: Through the creation of personal pledges to address environmental challenges, learners will learn that they can take concrete actions to make a positive impact on the environment.
Materials	<p>For example:</p> <ul style="list-style-type: none"> ● Colourful pictures or illustrations of various environmental issues (e.g., pollution, deforestation, endangered animals). ● Large poster boards. ● Markers, coloured pencils, and crayons. ● Glue, scissors, and tape. ● A projector and screen (optional).
Grouping and/or interaction	Divide the class into small teams 3-5.

<p>How to - Description</p> <p>Execution</p>	<p>Session 1: Introduction to Environmental Challenges (1 class session)</p> <p>Start the activity by gathering students in a circle and discussing the importance of nature and the environment. Encourage them to share their thoughts and feelings about the natural world.</p> <p>Show colourful pictures or illustrations of various environmental challenges using a projector or by presenting printed images. These could include pollution, deforestation, endangered animals, and more. Explain each challenge in simple terms and encourage questions from the students.</p> <p>After the introduction, distribute small pieces of paper and ask each student to draw their favourite animal or a tree. Then, ask them to share why they like it.</p> <p>Explain that we need to protect these animals and trees by taking care of the environment. This leads to the main activity.</p> <p>Session 2: Creating an Environmental Challenge Poster (1 class session)</p>
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Divide the class into small groups. Provide each group with a large poster board, markers, coloured pencils, and glue. Select one environmental challenge for each group or instruct each group to choose one challenge they discussed in the previous session. They will create a poster that raises awareness about that challenge and suggests simple ways to help.

Ask each group to draw a picture illustrating their chosen challenge on the poster board, label it, and write a simple message or slogan. For example, if they choose pollution, they could draw a picture of polluted water and write, "Keep Our Water Clean!"

After completing their posters, each group presents their work to the class. Encourage students to explain their chosen challenge and the actions they can take to address it.

Session 3: Action Plan and Pledge (1 class session)

Start this session by discussing the posters and the importance of taking action to protect the environment.

Ask learners to brainstorm simple actions they can take to help address the environmental challenges they have learned about. For instance, reducing waste, planting trees, or picking up litter.

Have each student choose one action they can commit to doing. Provide them with a pledge template and ask them to write down their commitment.

After completing their pledges, have a group pledge ceremony where each student shares their commitment with the class. This creates a sense of collective responsibility.

Display the environmental challenge posters in the classroom or a school hallway to raise awareness.

Reflection and Conclusion (20 minutes)

a. Ask the learners to reflect on the lesson and what they have learned from this activity.



	<p>b. Discuss the importance of countering environmental impacts and adopting an environmentally friendly lifestyle.</p> <p>Assessment: Assessment will be based on learners' participation and factors such as teamwork and creativity.</p>
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2. KEY CONCEPTS AND BENEFITS OF UPCYCLING

Activity 3: Reclaim and use. Eco fashion

Activity number 3	
Name of the activity	Reclaim and use. Eco fashion
Introduction of the topic/	<p>Upcycling is a process of using unwanted objects and turning them into something of higher value. It is advisable to teach learners how to reuse everyday objects and create fashionable accessories like bags.</p> <p>In this lesson learners will develop environmental awareness for reducing waste and recovering unnecessary/used packaging and old clothes.</p>
Age group/Level	ISCED 2= Lower Secondary Education
Learning objectives	<ul style="list-style-type: none"> ● Learners will understand the problem questions posed about the need to protect the environment nature and seek answers. ● Learners will be familiar with the terms ecology, recycling, upcycling. ● Learners will propose concrete actions related to waste reduction and waste management (in one's own home). ● Learners will awaken imagination, activity and creative invention.
Materials	<ul style="list-style-type: none"> ● Upcycled materials: old / not used anymore T-shirt ● Stationery: Scissors a marker

	<p>ruler</p> <ul style="list-style-type: none"> ● sewing accessories: <p>a needle thread</p>
Grouping and/or interaction	<p>Duration: 1-2 hours</p> <p>Interaction: Individual or Pairs</p>

<p>How to - Description</p> <p>Execution</p>	<p>1. Introduction</p> <p>Based on the teacher's provided associations, students independently arrive at the following deductions to determine the topic of the lesson: (Earth, preservation, waste, contamination, humanity, environment, globe, April 22nd).</p> <p>2. The teacher states the objectives of the lesson.</p> <p>3. The teacher asks learners questions connected to recycling, upcycling, ecology and explains the terms:</p> <p>Ecology- from the Greek means the science of home. Our home is the environment in which we live. It is where we grow up, where we learn new things. Ecology is everything that surrounds us. The world of flora and fauna - our contact with nature.</p> <p>Recycling - the process of attempting to recover and reuse materials (waste), with as little energy input as possible. Recycling in the colloquial sense of the word is the proper selection of waste and its subsequent processing into new products with maximum utilisation.</p> <p>Upcycling - the reuse of things with an increase in their value. Upcycling can become a hobby. Upcycling is therefore an activity that combines the possibility of creating and caring for the environment.</p> <p>4. After the theoretical part, the teacher conducts a guided interview to prepare students for the practical part.</p>
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Inform the learners that rubbish/waste materials can be reused in the upcycling process. Present the objects and indicate which recyclable materials they are made from, e.g.:

- a) fleece - from plastic bottles;
- b) a writing utensil holder or lantern - from a jar or tin.
- c) cable organiser - from a toilet paper roll. Simply glue a few rolls together and use the material as a cable holder.



Image source <https://masonjarcraftslove.com/rae-dunn-inspired-mason-jar-utensil-holders/>

5. Task, 'Putting knowledge into practice'.

Learners have the task of making an old, not used anymore T-shirt into an ecological shopping bag. Present a video tutorial and the stages of work:

<https://www.youtube.com/watch?v=ZCCnykGr8Yo>

Stage I

- Turn the T-shirt inside out.
- Lay it flat on a table or the floor.
- When unfolded, bend it in half, one sleeve to the other, so that the back is adjacent.

Stage II

- Draw a semi-circular line on the T-shirt to separate the sleeves and the head opening.
- Once drawn, cut out the line, removing any unnecessary pieces.
- Sew the half-circle in place, so that it does not spread to the sides.
- The only thing you do not need to stitch is the bottom straight part with the piping.
- Lay the T-shirt out again on a table or the floor and use a marker pen to draw on the fabric.

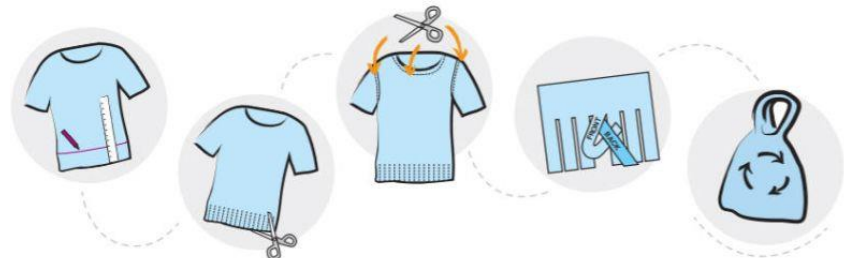
The lines can be straight or irregular.

- At the top, which is the straight line of the T-shirt, we make a larger line for the future "ears" of the bag.

Stage III

- With the lines prepared with a marker, we cut through with scissors.

- Stretch the bag slightly so that the lines open up a little, then turn the shirt right side out and you are done.



image

source

<https://resources.pepsicorecycling.com/resources/make-a-tote-bag-from-a-t-shirt/>

6. Summary of activities.

Giving a second chance to things that at first glance are suitable for throwing away can be a lot of fun and save us money. We will also be doing something environmentally friendly and it could eventually become a new hobby. Therefore, before you throw an item away, try to give it a second chance - you do not lose anything and you can gain a lot - a clean planet.

7. Exhibition of eco-friendly bags - a way of encouraging the rest of the school's students to be ECO.

Use of the device you created - sustainability of the artefact

Art: In art lessons, learners can use eco-bags as the containers for their school supplies, such as paints, scissors, glues, papers or their works of art. They can also design the decoration of their bags and do that. This activity promotes developing creativity.

Mathematics: In mathematics, learners can measure the dimensions of their bag and calculate its surface area to practise mathematical skills.



	<p>Language studies: In language studies, learners can practise speaking and writing skills. The task is to describe the eco-bag. Learners can write an essay about encouraging people to upcycling. This activity promotes global awareness, social responsibility, and critical thinking skills.</p>
Extra activities	<p>Ecology: Examining the relationships between living things. https://www.environmentalscience.org/ecology</p> <p>Guidance on waste definitions - European Commission https://ec.europa.eu/docsroom/documents/46954/attachments/8/translations/en/renditions/pdf</p> <p>How to make a tote bag from a T-shirt? https://resources.pepsicorecycling.com/resources/make-a-tote-bag-from-a-t-shirt/</p> <p>MarKa blog https://www.youtube.com/watch?v=ZCCnykGr8Yo</p>



Activity 4: Be an eco- sculpture architect

Activity number 4	
Name of the activity	Be an eco- sculpture architect
Introduction of the topic/	<p>Building environmental awareness is a process that should be initiated at a young age.</p> <p>Reusing raw materials has a huge impact on the environment. Recycling and upcycling save the energy and resources needed to make items, reduce landfill, and prevent further batches of materials from entering circulation. Upcycling used items can also inspire artists or fashion designers.</p>
Age group/Level	ISCED 1= Primary School children
Learning objectives	<ul style="list-style-type: none"> • Learners will understand the problem questions posed about the need to protect the environment. • Learners will propose actions related to waste reduction and waste management. • Learners can explain why it is necessary to dispose of rubbish in the bin, correctly segregating waste into the correct containers. • Learners will develop their creativity by creating eco-sculptures.
Materials	<ul style="list-style-type: none"> • Waste materials such as cardboard boxes, plastic bottles, cans, bottle caps, rubber bands, etc. • Scissors, glue, tape, string, and other craft materials. • Optional: paint, markers, stickers, and other decorative materials.
Grouping and/or interaction	<p>Duration: 2 hours</p> <p>Interaction: Pairs / teams</p>

How to - Description	1. Introduction
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Execution

Explain to the students the importance of protecting the environment and people's influence on it.

Ask learners:

What kind of waste do you throw away?

How often do you take the rubbish out?

Do you segregate waste at home?

What to do to be eco-friendly?

2. The teacher states the objectives of the lesson.

3. The teacher asks learners questions connected to recycling, upcycling and explains the terms (it is useful to present short films about recycling and upcycling).

Recycling-

<https://www.youtube.com/watch?app=desktop&v=Fex-wvrOZf4>

Upcycling-

<https://www.youtube.com/watch?v=OsfG7i8Lyf8>

https://www.youtube.com/watch?v=9jl27zb35_A

4. After the theoretical part, the teacher conducts a guided interview to prepare students for the practical part.

Waste separation. The most important principle is separate raw materials from non-recyclable waste. Which raw materials do we separate? These are plastics and metals, paper and glass packaging.

The learners have to classify this waste into different bins: newspapers and magazines, notebooks and books, unscrewed and crushed plastic drinks bottles, milk cartons, bottle tops and caps from jars, tree bark, grass cuttings, fruit peelings, yoghurt packaging, shampoo bottle, jam jar.

Tell some additional information.

What time in nature decomposes:

A paper handkerchief? (3 months)

A match? (6 months)

Chewing gum? (5 years)

A can? (200 years)



A plastic bottle? (100 to 1,000 years)

<https://www.goodgoodgood.co/articles/how-long-does-it-take-to-decompose#:~:text=According%20to%20Electronics%20Recyclers%20International,of%20computers%20and%20other%20electronics.>

How long does it take to produce:

100 sheets of paper? (Cutting down a two-metre tree, energy of 50 light bulbs, 50 litres of water)

100 sheets of unbleached paper from recycled paper? (2 newspapers, 8 light bulbs, 8 litres of water)

What can be produced from:

One fleece jumper? (from 27 plastic bottles)

One car? (from 19 000 tin cans)

One bicycle? (from 670 fizzy drink cans)

5. Task: 'Putting knowledge into practice'.

Learners have to imagine they are architects who want to help to reduce the waste and their task is to build eco -sculptures.

Provide some video examples:

<https://www.youtube.com/watch?v=ckUxqwwCKGk>

<https://www.youtube.com/watch?v=00xeypmHMbg>

Give instructions how to make a cardboard castle - students may not know what sculpture to make, so this is a perfect idea.

Video tutorial how to make a castle:

<https://www.youtube.com/watch?v=9vdO2Qm7q1w>

Stages how to make a castle from a cardboard:

1. Trim the flaps off your box.
2. Cut some battlements.
3. Make a flag tower using a toilet paper roll, a stick or a straw and colour paper.
4. Add it to one front corner. /You can make more flag towers. /
5. Cut the drawbridge into the facade.
6. Thread some string through so you can draw the drawbridge.
7. Cut out the windows.
8. Decorate your castle.

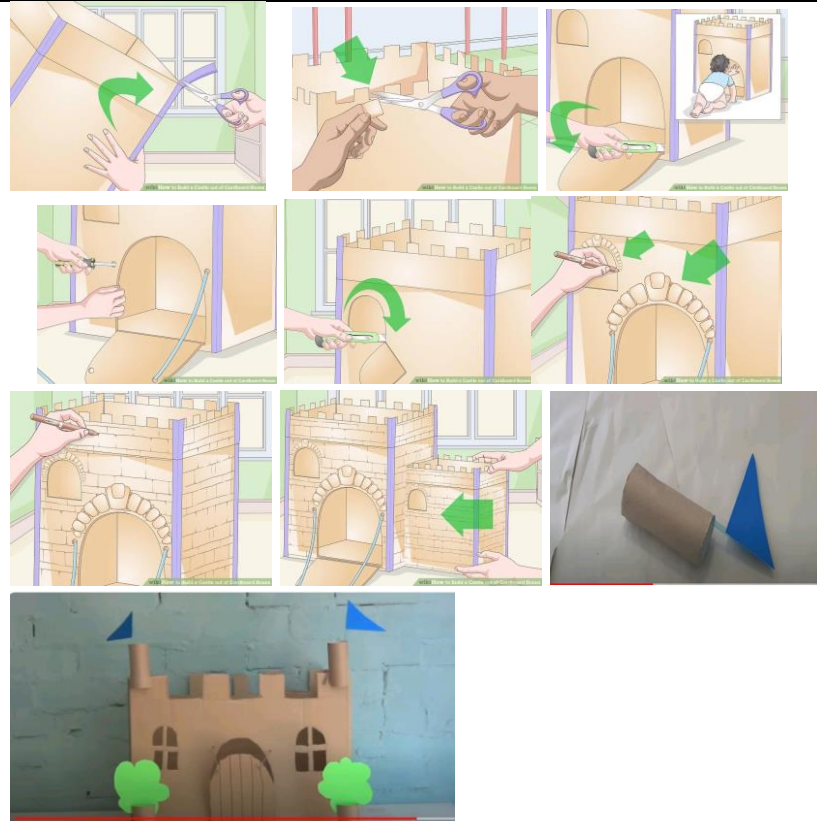


image source: <https://www.wikihow.com/Build-a-Castle-out-of-Cardboard-Boxes>

<https://www.youtube.com/watch?v=9vdO2Qm7q1w>

Learners work in pairs or groups of 4 and create different sculptures made from materials brought earlier (cardboard boxes, plastic bottles, cans, bottle caps, rubber bands, etc.).

6. Summary of activities.

Teaching young learners about upcycling and recycling is the best way of building environmental awareness. Especially action learning like building sculptures helps to understand the importance of ecological behaviour.



image

source:

<https://www.youtube.com/watch?v=9vdO2Qm7q1w>

7. Exhibition of eco-sculptures - a way of encouraging the rest of the school students to be ECO.



<p>Use of the device you created - sustainability of the artefact</p>	<p>Art: In art lessons, learners can use eco-sculptures as models for drawing or painting. They can prepare an exhibition of works based on museum exhibitions with explanations of used materials and how long it takes to decompose in nature. The teacher can show the learners examples of modern art using the internet. This activity promotes developing creativity.</p> <p>Mathematics: In mathematics, learners can prepare the table and measure the sculptures - their length, width, height. They can count the number of ingredients used to build the sculptures and then compare the results. This activity promotes developing global awareness, social responsibility and mathematical skills.</p>
<p>Extra activities</p>	<p>From cardboard to art. Larger than life sculptures. https://www.youtube.com/watch?v=ckUxqwwCKGk</p> <p>How to build the castle out of cardboard boxes. https://www.wikihow.com/Build-a-Castle-out-of-Cardboard-Boxes</p> <p>How to make your own cardboard play castle. https://www.youtube.com/watch?v=9vdO2Qm7q1w</p> <p>How long it takes 50 common items to decompose. https://www.goodgoodgood.co/articles/how-long-does-it-take-to-decompose#:~:text=According%20to%20Electronics%20Recyclers%20International,of%20computers%20and%20other%20electronics.</p> <p>Make art using a cardboard box. https://www.youtube.com/watch?v=00xeypmHMbg</p> <p>Recycling for kids. Learn how to Reduce, Reuse and Recycle. https://www.youtube.com/watch?app=desktop&v=Fex-wvrOZf4</p> <p>Rubbish Rebels video. Upcycling. https://www.youtube.com/watch?v=9jl27zb35_A</p> <p>Upcycling: what is it and why it matters. https://www.youtube.com/watch?v=OsfG7i8Lyf8</p>



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3. HOW STEAM CAN BE USED FOR TEACHING UPCYCLING TO CHILDREN

Activity 5: Upcycled Wearables

Activity number 5	
Name of the activity	Upcycled Wearables
Introduction of the topic/	<p>Have students view local design artists (e.g. the jewelry of Yuma Fujimaki here). Ask learners to describe the materials that the artist uses and to describe what makes the work unique. Learners could then identify the items that we can upcycle in our school and how can we create something new, useful or innovative out of these items?</p> <p>Discuss the difference between recycling and upcycling. Consider that upcycling happens with materials which cannot traditionally be recycled (like computer parts or old machine parts). Share that engineers and designers both identify problems and then seek out new ways to solve that problem.</p>
Age group/Level	ISCED Level 2 - Lower Secondary Education (12 - 15 years old)
Materials	<ul style="list-style-type: none"> ● Non-recyclable materials: circuit boards, machine parts, nuts, bolts, etc. ● Sketch paper and pencils. ● Nails, screws, straight edge, ● Hammers, hand saws, power tools (for age appropriate groups) ● Cutting mats, tape measure, screwdrivers, knives
Grouping and/or interaction	Individual
How to - Description, Execution	<ol style="list-style-type: none"> 1. Encourage learners to look for materials or in some cases you could provide students with a variety of old "non-recyclable" materials such as circuit boards,



	<p>machine parts, and other so-called “junk”.</p> <ol style="list-style-type: none"><li data-bbox="644 286 1461 488">2. Students should each brainstorm ways to take these parts and upcycle them into a piece of wearable art. Students will need to investigate how to create their wearable art through various building/adhesion techniques. Create a sketch and journal building steps.<li data-bbox="644 544 1461 656">3. Students create their wearable art using the materials and techniques they explored. Students must make adjustments as necessary through their design process.<li data-bbox="644 712 1461 913">4. Students present their finished upcycled wearable art as a gallery presentation to their peers. Provide a written statement that describes the process, materials used and how the parts were transformed for a new purpose.
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Activity 6: Turning Trash into Treasure

Activity number 6	
Name of the activity	Turning Trash into Treasure
Introduction of the topic/	<p>Students will learn about upcycling and apply STEAM principles to create their own upcycling project, with focus on the students' understanding of upcycling and STEAM principles through their upcycling projects and their presentation to the class.</p> <p>The overall objective is to have students research and present on the environmental benefits of upcycling.</p>
Age group/Level	ISCED Level 1 - Primary School (8 - 11 years old)
Materials	<ul style="list-style-type: none"> ● A variety of recyclable materials such as cardboard boxes, plastic bottles, paper rolls, and fabric scraps ● Scissors ● Glue or tape ● Markers or paint ● Measuring tape or ruler
Grouping and/or interaction	Pairs or Teams

How to - Description, Execution	<ol style="list-style-type: none"> 1. Introduction Introduce the concept of upcycling and explain how it differs from recycling. Show examples of upcycled items such as bird feeders made from plastic bottles, pencil holders made from cardboard tubes, and bags made from old t-shirts. Ask students what they think can be upcycled and how it can be done. 2. Brainstorming Divide the students into small groups and have them either look for relevant materials or provide them with a variety of recyclable materials. Ask each group to brainstorm a list of upcycling ideas they can make using the materials provided. Encourage them to think
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creatively and use their imagination.

3. Planning

Instruct each group to choose one upcycling idea from their list and create a plan for their project. They should sketch a design and make a list of the materials and tools they will need.

4. Construction

Provide the materials and tools needed for each group to begin constructing their upcycling project. Circulate the room and provide guidance as needed. Encourage students to work collaboratively and use problem-solving skills to overcome any challenges they encounter.

5. Presentation

When the projects are complete, have each group present their upcycling project to the class. Ask them to explain their design, the materials they used, and the process they followed. Encourage the class to ask questions and provide feedback.

6. Reflection

Conclude the lesson by asking the students to reflect on what they learned about upcycling and how they applied STEAM principles to create their project. Ask them to discuss how they could continue upcycling in their daily lives.

7. Assessment

Assess students' understanding of upcycling and STEAM principles through their upcycling projects and their presentation to the class. Observe their problem-solving skills, collaboration, and creativity during the construction phase.





4. HOW TO IMPLEMENT THE DESIGN PROCESSES IN THE CLASSROOM

Activity 7: Building a Rube Goldberg Machine using Upcycled Materials

Activity number 7	
Name of the activity	Building a Rube Goldberg Machine using Upcycled Materials
Introduction of the topic/	<p>In the 1920s, the American cartoonist Rube Goldberg began drawing his series "Inventions of Professor Lucifer Gorgonzola Butts". The comics were always the same. Lucifer, who was never seen in the comics, experimented with extremely complicated machines that performed very simple tasks: using a napkin, watering the plants or making orange juice. Goldberg died in 1970, his legacy, though, goes on. "Rube Goldberg machines" are a genre on YouTube and TikTok and have appeared in many films and TV series. These machines even have their own Guinness World Record.</p> <p>This said, with this lesson plan, teachers can design an activity-based lesson that incorporates all five elements of the design process. As a problem-solving exercise, learners have the task of designing a Rube Goldberg machine that can extinguish a candle. The machine should consist of at least three separate components and include a blower. Moreover, the machine should be built using recycled materials. Once finished and tested, the blower should be repurposed and used as a garden whirl.</p> <p>Example of a Rube Goldberg machine:</p>



	<p>Source¹ https://www.youtube.com/watch?v=k6nhID36eA4</p>
<p>Age group/Level</p>	<p>ISCED 2 = Lower Secondary Education ISCED 3 = Upper Secondary Education</p>
<p>Learning Objectives</p>	<ul style="list-style-type: none"> • Learners will understand the STEAM concepts and the engineering design process and apply them transversally through practice. • Learners will learn about the engineering design process and how to apply it to design and build a functional Rube Goldberg machine. • Learners will use their creativity and critical thinking skills to come up with innovative solutions to this upcycling challenge.
<p>Materials</p>	<p>For the construction of the Rube Goldberg machine, learners can use any kind of recycled material, but priority should be given to materials coming from school waste. For example, using cans (drink cans), cups (yoghurt cups) and containers (baby wipe boxes) saves a lot of money on classroom materials and teaches good environmental habits.</p> <p>More examples -</p> <ul style="list-style-type: none"> • Upcycled materials: cardboard boxes, plastic bottles, old toys (marbles or balls), among others. • Crafting materials and stationery: Glue, tape, scissors, measuring tools (ruler, protractor, among others)

¹ Shiffman, J. (2016, 3 May). Rube Goldberg Machines. Boom Box Post. Retrieved from: <https://www.boomboxpost.com/blog/2016/4/22/rube-goldberg-devices>
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



Grouping and/or interaction	Duration: 2-3 class periods (depending on the complexity of the project) Interaction: Teams (3 - 4 people per group)
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<p>How to - Description</p> <p>Execution</p>	<p>Learners design and build a Rube Goldberg machine using upcycled materials. (The STEAM approach and the engineering design process are incorporated transversely into this lesson plan).</p> <p>STEAM concepts:</p> <ul style="list-style-type: none"> ● Science: gravity, motion, energy, force. ● Technology: using tools and materials to build a machine. ● Engineering: applying the engineering design process to create a functional machine. ● Arts: designing the machine to be visually appealing. ● Maths: measuring and calculating distances, angles, and other variables. <p>Engineering Design Process > The engineering design process is a series of steps that engineers follow to find a solution to a problem (see Module 4 to learn more about this topic).</p> <p>Day 1</p> <p>Introduction:</p> <ol style="list-style-type: none"> 1. Introduce the concept of Rube Goldberg machines and show examples of different machines in action (you can use this video https://youtu.be/k6nhID36eA4). 2. Explain to your learners that the session involves a series of steps that they must follow (Engineering Design Process). Also, tell them that the activity they will be taking part in will test their creativity, as they will be experimenting with different ways to turn ordinary things into a machine that can blow candles. <p>a. Teaching aid:</p>
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i. **The Design Process**

<https://www.pbslearningmedia.org/resource/adptech12.sci.engin.design.idsprocess/the-design-process/>

Procedure:

3. Steps 2 & 3 (from the EDP) > Brainstorm/Design -

Explain the project objective (see Introduction of the topic) and review the engineering design process.

a. **Teaching aid:**

i. **Simple Machines and the Rube Goldberg Challenge**

<https://www.youtube.com/watch?v=nf094faga5w&list=RDCMUCpRCG3gGtWqieJe-LGmi93w&index=3>

ii. **Hands-on activity - Design and Build a Rube Goldberg**

https://www.teachengineering.org/activities/view/cub_simp_machines_lesson05_activity1

iii. Divide Learners into small groups and distribute materials. Learners brainstorm ideas for their machines and begin designing a blueprint or sketch.

4. Learners continue designing their machine, incorporating STEAM concepts and following the steps of the engineering design process.

5. Encourage learners to use upcycled materials as much as possible. Monitor and assist learners as they work on their designs. Learners should have a clear plan and blueprint for their machine by the end of Day 1.

Day 2

6. Step 4 > Build (Test & Evaluate / Redesign) -

Learners begin building their machine, following their blueprint and making adjustments as needed.



	<p>7. Encourage learners to work collaboratively and communicate effectively within their group. Monitor and assist learners as they build their machine.</p> <p>Day 3</p> <p>*Depending on the complexity one more day can be added to the planning.</p> <p>8. Learners finish building their machine. Groups test their machine and make any necessary adjustments.</p> <p>9. Encourage learners to evaluate their machine's performance and consider ways to improve it.</p> <p>Day 4</p> <p>10.Step 5 > Sharing solutions - Learners present their machine to the class and explain the STEAM concepts they used (e.g. gravity, motion, tools used).</p> <p>11.Encourage learners to be creative and incorporate artistic elements into their presentations. Classmates ask questions and provide feedback on each group's machine.</p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>As these are machines that are not meant to last, this activity incorporates assessment guidelines for teachers.</p> <p>Learners will be assessed on their ability to:</p> <ul style="list-style-type: none"> ● Work collaboratively and communicate effectively within their group. ● Apply STEAM concepts and the engineering design process to design and build a functional Rube Goldberg machine. ● Use upcycled materials creatively and effectively. ● Evaluate their machine's performance and make necessary adjustments. ● Present their machine and explain the STEAM concepts and engineering design process they used.



Extra activities

NASA STEM Engagement: NASA provides a wide range of STEM activities and resources for learners of all ages. Engineering design challenges relating to space exploration can be found.

<https://www.nasa.gov/stem>

Explore **TeachingEnglish.org**'s extensive library of K12 activities, lessons, and challenges within their STEM

Curriculum:

www.teachengineering.org/curriculum/browse?EngineeringCategory=Full%20design



Activity 8: Upcycling STEAM Challenge: Engineering Design Process for Primary School Children

Activity number 8	
Name of the activity	Upcycling STEAM Challenge: Engineering Design Process for Primary School Children
Introduction of the topic/	In this lesson plan, primary school children will learn about the concept of upcycling and the engineering design process . They will use their creativity and critical thinking skills to design and build a functional and aesthetically pleasing product using upcycled materials.
Age group/Level	ISCED 1 = Primary Education
Learning Objectives	<ul style="list-style-type: none"> • Learners will understand the concept of upcycling and its environmental benefits. • Learners will learn about the engineering design process and how to apply it to design and build a functional and aesthetically pleasing product using upcycled materials. • Learners will use their creativity and critical thinking skills to come up with innovative solutions to upcycling challenges.
Materials	<p>For the construction of the product/object/artefact, learners can use any kind of recycled material, but priority should be given to materials coming from school waste. For example, using cans (drink cans), cups (yoghurt cups) and containers (baby wipe boxes) saves a lot of money on classroom materials and teaches good environmental habits.</p> <ul style="list-style-type: none"> • Upcycled materials: plastic bottles, cardboard boxes, tin cans, old magazines, and fabric scraps, among others. • Crafting materials and stationery: Glue, tape, scissors, and markers among others.



Grouping and/or interaction	Duration: 2-3 class periods (depending on the complexity of the project) Interaction: Pairs or Teams (3 - 4 people per group)
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How to - Description Execution	<p>Day 1</p> <p>Introduction to Upcycling and the Engineering Design Process:</p> <ol style="list-style-type: none"> 1. Begin the lesson by introducing the concept of upcycling and its environmental benefits. Ask learners if they have heard of upcycling before and what they know about it. <div data-bbox="635 801 954 1254" data-label="Image"> </div> <p>Show examples of upcycled products such as a pencil holder made from a tin can or a tote bag made from old t-shirts. Discuss how these products were made and why they are better than buying new products.</p> <p>Image source: Thrift Diving²</p> <p>Introduce the Engineering Design Process and its importance in solving real-world problems. Explain the engineering design process and how to apply it to address design challenges. Give an overview of each step (Define the problem, Generate Ideas, Design and Build, Test and Evaluate, Improve and Redesign) and give examples (see Module 4 to learn more about this topic).</p> <p>Procedure:</p> <ol style="list-style-type: none"> 2. Brainstorming - Divide learners into groups of 3-4 and give each group a set of upcycled materials. Ask learners to come up with a design challenge related to upcycling. For example, design a toy using only upcycled
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² <https://thriftdiving.com/diy-crayon-holder-from-a-knife-block/>



	<p>materials or design a piece of furniture using cardboard boxes.</p> <p>Ask each group to brainstorm and ideate possible solutions to the design challenge. Encourage learners to think outside the box and come up with new and innovative ideas.</p> <p>3. Design - Ask each group to choose the best idea from their brainstorming session and create a detailed design plan. The plan should include sketches, materials needed, and step-by-step instructions.</p> <p>Day 2</p> <p>4. Build - Provide learners with crafting materials and give them time to build their product. Likewise, and to foster sustainability and creativity, you can encourage learners to bring materials from home that they can upcycle. Encourage learners to work collaboratively and help each other out.</p> <p>5. Test and Evaluate - Once the product is complete, ask each group to test their product and evaluate its functionality and aesthetics. Did it meet the design challenge? Is it visually appealing? Does it function properly?</p> <p>Give learners time to make any necessary improvements and redesigns. Encourage them to think critically and use feedback to improve their product.</p> <p>6. Share solutions/ Presentations and Reflections- Ask each group to present their product to the class. They should explain their design challenge, their design process, and the features and benefits of their product.</p> <p>Wrap up the lesson by asking learners to reflect on what they learned about upcycling, the Engineering Design Process.</p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>Even though there are millions of examples on the internet from which teachers can draw from, they should set design challenges catered to their reality and their needs. In other words, functional and aesthetically pleasing products (using upcycled materials) that are useful for their school and/or classroom. More importantly, the difficulty level of the task should be adapted to the age of the learners.</p>



	<p>Here is an example of an activity: Learners have to build an "Activity Cube" (also known as a Busy Box or Didactic Cube) that serves several purposes.</p> <p>An Activity Cube is a multifunctional toy for babies and toddlers. On the 6 sides of the cube are various objects with different artefacts that the child can touch, explore and manipulate.</p> <p>The cubes can be used for different purposes and as props used in/for multiple subjects.</p> <p>Arts: The suggestion is to stack the cubes to create a curtain that the children can use as a theatre curtain or backdrop for class/school performances.</p> <p>Maths: Learners can place the cubes against the sunlight and on the floor and let their creativity run wild. They then mark on a piece of paper or in the schoolyard the outline of the shadow they discovered when placing the cubes on the ground. Then the teacher can ask the following questions: What is the shadow? Why did the shadow form on the floor? Can the same game be done with other materials?^{3 4}</p> 
<p>Extra activities</p>	<p>PBS Design Squad: PBS Kids provides fun engineering challenges and activities for children. It is an excellent</p>

³ Riley, S. (2021, 29 January). Your Guide to STEAM Design Challenges. The Institute for Arts Integration and STEAM. Retrieved from <https://artsintegration.com/2018/08/01/your-guide-to-steam-design-challenges/>

⁴ Fundación Mi Parque, Vidal D., M. T., Honour M., M., & Pantoja K., P. (2021). ¡Volvamos a Jugar! Guía de Aprendizaje al aire libre. Fondo de las Naciones Unidas para la Infancia, UNICEF. Retrived from <https://www.unicef.org/chile/informes/volvamos-a-jugar-guia-de-aprendizaje-al-aire-libre>

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	<p>resource to find hands-on projects as well as videos that explain the design process. https://pbskids.org/designsquad/build/spinner/</p> <p>TryEngineering.org: This website contains engineering lesson ideas, activities, and resources for both teachers and learners. It covers a broad range of subjects and grade levels. https://tryengineering.org/teacher/lesson-plans/ac-motor/</p>
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5. CREATING IDEAS RELATED TO ART AND MUSIC

Activity 9: Transforming daily objects into art

Activity number 9	
Name of the activity	Transforming daily objects into art
Introduction of the topic/	<p>Transforming everyday objects into art is a creative process that challenges us to see the world around us in new and unexpected ways. It involves taking mundane objects and reimagining them as something beautiful, thought provoking, or humorous. By transforming ordinary things into works of art, we not only exercise our imagination and creativity, but we also make a statement about the potential of art to be found in the most unexpected places.</p> <p>In this lesson, learners will explore the process of transforming everyday objects into works of art through a series of exercises. We will use various materials and techniques, including drawing, collage, and sculpture, to experiment with different ways of transforming objects. We will also look at examples of contemporary artists who use found objects in their work, such as Marcel Duchamp and Claes Oldenburg. By the end of this lesson, students will have gained a deeper appreciation for the potential of everyday objects to inspire art, and they will have created their own unique works of art from everyday things.</p>



	 <p>Source https://www.britannica.com/biography/Claes-Oldenburg</p>
Age group/Level	<p>ISCED 2 = Lower Secondary Education ISCED 3 = Upper Secondary Education</p>
Learning Objectives	<p>Learners will learn how to transform everyday objects into works of art through a series of exercises, culminating in a final project.</p> <p>Learners will gain a deeper appreciation for the transformative power of art in everyday objects.</p>
Materials	<ul style="list-style-type: none"> ● A variety of everyday objects such as paper clips, straws, plastic utensils, bottle caps, etc. ● Drawing paper or sketchbooks ● Pencils, erasers, and coloured pencils ● Glue or glue sticks ● Scissors ● A camera or smartphone for taking photos of final projects
Grouping and/or interaction	<p>Duration: 1-2 hours Interaction: Pairs or Teams (3 - 4 people per group)</p>

How to - Description

Execution

Procedure:

Introduction:

1. Begin the lesson by asking students if they have ever looked at everyday objects and thought about how they could be transformed into art.
2. Show examples of contemporary artists who use found objects in their work, such as Marcel Duchamp "Bicycle Wheel" and Claes Oldenburg "Soft Typewriter".



[MoMa.org](https://www.moma.org)





Mutual Art

3. Explain that the lesson will involve a series of exercises that **challenge learners to think creatively** and experiment with different ways of transforming everyday objects into art.

Exercises:

Drawing Exercises:

- Provide each Learner with an everyday object (e.g., a kitchen utensil, a shoe, or a toy).
- Instruct them to create a series of drawings that depict the object in various imaginative ways. For instance, they can draw the object as a towering skyscraper, a whimsical character with a personality, or an abstract geometric pattern.
- Encourage them to experiment with different artistic styles, such as realism, surrealism, or abstraction.

Collage Exercises:

- Give Learners a selection of found objects (e.g., old magazines, cardboard, bottle caps, and fabric scraps).
- Ask them to use these objects to craft collages. They can cut the objects into various shapes or combine them to form new, unexpected compositions.
- Emphasise the importance of considering composition and colour as they arrange their collages.

Sculpture Exercises:

- Provide Learners with additional objects (e.g., wooden blocks, wire, and small discarded items like screws or buttons).
- Instruct them to use these materials, along with the original object, to create small sculptures. They can construct these sculptures by assembling the objects as building blocks or by integrating them with materials like clay or wire.



	<ul style="list-style-type: none"> ● Encourage Learners to pay attention to the balance and form of their sculptures. <p>Final Project:</p> <ul style="list-style-type: none"> ● After completing the exercises, ask learners to select one of the objects they have been working with. ● Challenge them to transform this chosen object into a final artwork, which can take the form of a drawing, collage, or sculpture. ● Encourage learners to think creatively and use unconventional techniques or materials to enhance their final projects. ● Have each learner present their final project to the class, explaining their thought process, the techniques they used, and how they transformed the chosen object into a piece of art. <p>Assessment:</p> <p>Learners will be assessed on their creativity, technical skill, and ability to transform everyday objects into works of art. Additionally, they will be assessed on their ability to communicate their ideas and thought process during the final project presentation.</p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>When possible, give one or two proposals for the use of the artefact it was created</p> <p>Example:</p> <ul style="list-style-type: none"> ● Mathematics: The artefact created through the drawing exercise could be used as the basis for a tessellation project, where students create a pattern that repeats without gaps or overlaps. The artefact created through the sculpture exercise could be used as a physical model for exploring geometric concepts such as symmetry, shapes, and angles. ● Science: The artefact created through the collage exercise could be used as a visual representation of a concept or process in science, such as the water cycle or the stages of mitosis. The artefact created through




	<p>the sculpture exercise could be used to illustrate principles of engineering or physics, such as stability, balance, and tension.</p> <ul style="list-style-type: none">● Language Arts: The artefact created through any of the exercises could be used as a prompt for creative writing, where students write a story or poem inspired by the object or the transformation process. The artefact could also be used to teach vocabulary and descriptive language, as students describe the object and the materials used to transform it.
Extra activities	If time permits, Learners could research and write about artists who use found objects in their work. They could also create a collaborative installation using found objects, or design their own scavenger hunt challenge to find and transform objects outside of the classroom.



Activity 10: Creating musical Instruments with waste

Activity number 10	
Name of the activity	Creating musical Instruments with waste
Introduction of the topic/	The topic of creating musical instruments with waste is an engaging and hands-on way to teach students about the importance of recycling and upcycling materials, while also exploring concepts in science, maths, and the arts. By using waste materials to create musical instruments, students can learn to think creatively and resourcefully, and they can develop their problem-solving skills by experimenting with different shapes, sizes, and materials to create different sounds. They can also develop their teamwork and collaboration skills by working together to create a musical ensemble, and they can learn about the history and cultural significance of different types of musical instruments around the world. Overall, the topic of creating musical instruments with waste is an exciting and interactive way to engage students in interdisciplinary learning and to inspire them to think critically and creatively about the world around them .
Age group/Level	ISCED 1 = Primary Education
Learning Objectives	<ul style="list-style-type: none"> ● Learners will identify different types of waste materials that can be used to create musical instruments. ● Learners will create a musical instrument using waste materials. ● Learners will play and appreciate different sounds produced by their musical instruments. ● Learners will realise the importance of recycling and reusing waste.
Materials	For the construction of the product/object/artefact, learners can use: Upcycled materials: cardboard boxes, plastic bottles, cans, bottle caps, rubber bands, etc.

	Crafting materials and stationery: Glue, tape, scissors, and markers among others.
Grouping and/or interaction	Duration: 1-2 hours Interaction: Pairs or Teams (3 - 4 people per group)

How to - Description	<ul style="list-style-type: none"> - Introduction (15 minutes) <ol style="list-style-type: none"> a. Begin by asking the students if they have ever played a musical instrument before. b. Introduce the concept of creating musical instruments from waste materials. c. Show examples of musical instruments made from waste materials and discuss how they were created.
Execution	 <p>Image source</p> <ol style="list-style-type: none"> d. Discuss the importance of recycling and reusing waste materials. <ul style="list-style-type: none"> - Brainstorming (15 minutes) <ol style="list-style-type: none"> a. Have the learners brainstorm different types of waste materials that can be used to create musical instruments. b. Write down their ideas on the board or chart paper. - Creating the Instruments (40 minutes) <ol style="list-style-type: none"> a. Have the students choose a waste material and think about what kind of musical instrument they can make from it. <p>Suggestions</p> <ol style="list-style-type: none"> b. Provide the necessary materials and let the students create their musical instruments. c. Encourage the students to be creative and use their imaginations. d. Assist the students as needed. <ul style="list-style-type: none"> - Testing and Playing the Instruments (30 minutes) <ol style="list-style-type: none"> a. Have the students test and play their musical instruments. b. Encourage them to experiment with different sounds and techniques. c. Discuss the different sounds produced by their instruments. d. Play some simple songs or rhythms as a class. <ul style="list-style-type: none"> - Reflection and Conclusion (20 minutes)



	<p>a. Ask the students to reflect on their experience of creating musical instruments from waste materials.</p> <p>b. Discuss the importance of recycling and reusing waste materials to reduce waste.</p> <p>c. Conclude the lesson by having the students share their instruments with the class.</p> <p style="text-align: center;">- Assessment:</p> <p>Assessment will be based on the students' ability to build a musical instrument from waste materials and their participation in the process of playing the musical instrument, taking into account criteria such as CREATIVITY, TEAMWORK, PROBLEM-SOLVING and ENGAGEMENT.</p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>In Maths, learners can use their instruments to explore patterns and rhythms. They can experiment with creating beats and rhythms incorporating fractions and decimals. For example, they could try dividing a beat into halves or quarters to observe the results. In addition, they can count the beats in a time signature to create rhythms.</p> <p>In Science, learners can use their instruments to investigate the properties of sound. Through experiments, they can examine how changing the size or shape of an instrument affects the pitch and volume of the sound produced. In addition, they can explore the influence of different materials on sound production. For example, comparing plastic instruments with cardboard ones allows them to analyse the variations in the resulting sounds.</p> <p>As part of the Social Studies subject, learners have the opportunity to use their instruments as a means of discovering and appreciating music and cultures from around the world. By carrying out research, they can learn about the instruments and even create their own versions using recycled materials. What's more, this exploration allows them to immerse themselves in the history of music and understand its evolution over time.</p> <p>In Language Arts learners can bring their instruments into play when exploring poetic styles and engaging in creative writing exercises. They can compose rhythms and melodies to enhance their writing projects. Additionally they will have the chance to learn how to effectively incorporate onomatopoeia techniques into their writing and use their instruments to create experiences.</p>



	<p>In Physical Education, learners can integrate their instruments to support dance and movement activities. They can create rhythms and beats that synchronise with the tempo of the music, reinforcing their movements. In addition, they can use their instruments as a means of exploring a range of movements, from deliberate and slow to fast, while exploring the harmonious connection between movement and music.</p>
<p>Extra activities</p>	<ul style="list-style-type: none"> ● Request learners to collaborate and perform a piece by utilising their respective instruments. ● Encourage learners to devise an instrument of intricacy employing discarded materials. ● Invite learners to conduct research and deliver a presentation regarding the repercussions of waste, on the environment emphasising how recycling can effectively mitigate its effects. <p>Roadie blog https://www.roadiemusic.com/blog/how-to-make-your-own-instruments-from-recycled-materials</p>





6. MATERIALS THAT CAN BE USED FOR UPCYCLING WITH CHILDREN

Activity 11: Piggy Bank

Activity 11	
Name of the activity	"Piggy Bank"
Introduction of the topic/	The importance of upcycled art crafts, such as the upcycled "Piggy Bank," in today's world, where environmental sustainability is paramount, cannot be overstated. Upcycling signifies a significant change in how we manage waste and conserve resources. Reusing trashed items, like plastic bottles or containers, to make something entirely new and useful lessens the load on our overburdened landfills while also giving materials that would otherwise contribute to environmental degradation a second chance. In particular, the upcycled Piggy Bank serves as a representation of creativity and mindful consumption. It demonstrates how a little creativity and innovation can take the ordinary and turn it into something extraordinary, serving as a compelling testament to the potential hidden within objects that are thought to be useless. Additionally, the value of upcycled piggy banks goes far beyond their positive effects on the environment. Involving students in the upcycling process teaches them priceless lessons. They gain knowledge about the fundamentals of recycling, the significance of minimising waste, and the creative potential in commonplace items as they work on making these "Piggy Banks". The next generation will become conscientious stewards of our planet as a result of this practical experience, which fosters a strong sense of environmental responsibility.
Age group/Level	ISCED 2 = Lower Secondary Education ISCED 3 = Upper Secondary Education
Materials	<ul style="list-style-type: none"> • Large plastic bottle • 5 bottle covers



	<ul style="list-style-type: none"> • Newspapers • Sticky tape • Googly eyes • Cardboard (for ears) • Pipe cleaner (for tail) • Craft paint (white + couple other colours) • PVA glue • Clear all purpose glue or glue gun • Clear varnish
<p>Grouping and/or interaction</p>	<p>Pairs or Teams</p>

<p>How to - Description</p> <p>Execution</p>	<ol style="list-style-type: none"> 1. Cut the bottle in half, discarding the middle section. Put the bottom part's deep edge in hot or boiling water and quickly push it inside the top part. Now it ought to fit inside. Use tape to hold in place. 2. To create four bottle covers for legs, connect them with sticky tape. 3. Use weak craft glue to attach newspapers to the bottle. 4. After painting the newspaper print with white to cover it, decorate as you like. 5. Connect the pipe cleaner tail, eyes, and ears (and paint them) using all-purpose glue or a glue gun. 6. Apply a final coat of clear glossy varnish to completely cover the piggy bank. In addition, you can trim the ears because they would not stay up. 7. After the piggy bank has dried completely, use the cutter to carefully make a coin-holding hole. Otherwise, you can use glittery nail polish to secure the edges.
<p>Use of the device you created - sustainability of the artefact</p>	<p>When possible, give one or two proposals for the use of the artefact it was created</p> <ol style="list-style-type: none"> 1. Value in Education: Increasing kids' awareness and participation in the upcycling process. They learn the value of creativity, waste reduction, recycling and upcycling from making this artefact. From a young age, this awareness fosters a sense of responsibility for the environment. 2. Promotion of Innovation and Creativity:



	<ul style="list-style-type: none">● <u>Encourages Creativity:</u> Upcycling activities inspire creativity in kids as they experiment with novel ways to turn commonplace items into useful and beautiful objects, like piggy banks.● Critical thinking skills are developed as children learn to solve problems relating to design and functionality.
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Activity 12: Tincan Lanterns

Activity 12	
Name of the activity	Tincan Lanterns
Introduction of the topic/	<p>Start by completely cleaning your cans after removing the wrapper. On lanterns built by kids, simple shapes and patterns work best. Consider lilies, stars, hearts, etc.</p> <p>You can sketch the shape on your tin can in advance if you would like using a permanent marker. (To get the markings off later, just apply a little hand sanitizer.) Alternatively, you can draw your pattern by hand. Place your can in the freezer for the night after filling it with water, leaving about a half-inch space at the top. You can make your pattern without denting the can by using the frozen water. Use a nail to gently hammer against the can after the water has frozen solid to make your design. A kitchen towel placed underneath the can will stop it from rolling. Additionally useful for warming up chilly fingers while working with that chilly metal.</p> <p>Once your design is complete, cut two holes, one on each side, at the top of the tin can lantern so that you can insert the handle. For older kids, you can decide to make lanterns out of wire hanger bits. For instance, you can decorate the lanterns with colourful pipe cleaners, which they could easily do on their own. It is time to light the lantern when the ice has melted and been taken out. These tiny cans work best with tea light candles. Remember that the holes you made with the nail and hammer will now have sharp edges because of them. Children should not reach inside the can lanterns to prevent wounds. In its place, you may turn the can on its side to get the battery lights out.</p>
Age group/Level	ISCED 1 = Primary Education

Materials	<ul style="list-style-type: none"> ● Empty Cans (We used soup cans and one from canned vegetables.) ● Hammer ● Nail ● Pipe Cleaners (or piece of wire) ● Tea Light Candle
Grouping and/or interaction	Pairs or Teams

<p>How to - Description</p> <p>Execution</p>	<p>STEAM Education is an approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialogue, and critical thinking⁵.</p> <p>Tin Can Lanterns activity can be the ideal introduction if you have a future engineer in the classroom. This activity can keep your young engineer occupied for hours while teaching them technical vocabulary related to electrical tools. Moreover, young students can learn about the importance of the environment in a fun way and learn that there is also a way to create something from recycled items. Therefore, they will also acquire knowledge regarding the importance of upcycling through the STEAM approach. There is more to that as this activity challenges students and involves a lot of trial and error, tweaking and fixing and even redesigning to create a better outcome the next time.</p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>"Tin Can Lanterns "</p> <p>The proposal is to create an artistic product where its use will not expire in time. For instance, with this proposed activity students will be saving materials from landfill, reducing what goes into the landfill, minimize the use of natural resources and at the same time will be celebrating artisanal work and old school craftsmanship.</p>

⁵ Riley, S. (2022, 8 September). What is STEAM Education? The Definitive Guide for K-12 Schools. The Institute for Arts Integration and STEAM. Retrieved from :<https://artsintegration.com/what-is-steam-education-in-k-12-schools/>

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7. TIPS FOR UPCYCLING ENTREPRENEURS

Activity 13: Upcycling Entrepreneur Challenge

Activity number 13	
Name of the activity	Upcycling Entrepreneur Challenge
Introduction of the topic/	In this activity, learners will explore entrepreneurship through the lens of upcycling. They will learn about the principles of upcycling and how it can be a creative and profitable business opportunity. Learners will understand the importance of managing waste production efficiently and reducing their environmental impact while increasing profitability.
Age group/Level	ISCED 2 = Lower Secondary Education
Learning objectives	<ul style="list-style-type: none"> • Understand the principles of upcycling and how it differs from recycling. • Analyse different scenarios to identify upcycling opportunities and create sustainable products. • Develop a business plan for an upcycling venture, considering financial management and marketing strategies.
Materials	<ul style="list-style-type: none"> • Various recycled materials (e.g. plastic bottles, cardboard boxes, old fabric) • Business Model Canvas template
Grouping and/or interaction	Teams

How to - Description	1. Introduction and Upcycling principles:
Execution	The teacher will introduce learners to the concept of upcycling and explain how it differs from recycling. They will also provide examples of successful upcycling ventures to inspire learners.



	<p>2. Upcycling Entrepreneur Challenge: Learners will work in teams to brainstorm and develop ideas for an upcycling business. They will use the Business Model Canvas template to outline their business plan, considering key elements such as target market, value proposition, revenue streams, and cost structure.</p> <p>3. Market Research and Customer Analysis: Each team will conduct market research to identify their target customers and understand their preferences and needs. They will also analyse potential competitors and explore market opportunities for their upcycled products.</p> <p>4. Financial Management and Sustainability: Learners will analyse the financial aspects of their upcycling venture, including start-up costs, pricing strategies, and revenue projections. They will also consider the environmental and social sustainability of their business model.</p> <p>5. Presentation and Feedback: Each team will present their upcycling business plan to the class, explaining their ideas and strategies. The class will provide feedback and constructive suggestions to help improve the business plans.</p> <p>6. Conclusion and Reflection: The activity will conclude with a reflection session where learners will discuss the challenges and benefits of upcycling entrepreneurship. They will also reflect on the potential impact of their business on waste reduction and environmental sustainability.</p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>The upcycling business ventures developed by learners can be implemented as part of a school or community-based initiative. Learners can form partnerships with local businesses or organisations to collect waste materials and implement their upcycling ideas. The upcycled products can be sold at community events or online platforms, and the revenue</p>



	generated can be used to reinvest in the business or support environmental causes.
Extra activities	<ol style="list-style-type: none"> 1. Upcycling Market Day: Organise a market day at the school or a local community centre where learners can showcase and sell their upcycled products to the public. This event can be a great opportunity to promote upcycling and raise awareness about the importance of waste reduction. 2. Sustainability Awareness Campaign: Develop a sustainability awareness campaign around upcycling and waste reduction. Learners can create posters, videos, or social media campaigns to educate the community about the environmental benefits of upcycling. <p>Resource: The importance of green entrepreneurship https://www.oecd-ilibrary.org/sites/d286f12e-en/index.html?itemId=/content/component/d286f12e-en What is green entrepreneurship and why is it important? https://eudi.eu/what-is-green-entrepreneurship-and-why-is-it-important</p>



Activity 14: Upcycled Art Exhibition

Activity number 14	
Name of the activity	Upcycled Art Exhibition
Introduction of the topic/	In this activity, learners will explore the concept of upcycling and its importance in creating art from waste materials. They will learn about different examples of upcycled art and how it contributes to environmental sustainability. Learners will also understand the principles of the waste hierarchy and how they can contribute to reducing waste and promoting a circular economy.
Age group/Level	ISCED 1 = Primary Education
Learning objectives	<ul style="list-style-type: none"> • Understand the concept of upcycling and its significance in creating art from waste materials by identifying opportunities applicable in the event management environment. • Identify different examples of upcycled art and their environmental impact. • Apply the principles of the waste hierarchy to create their own upcycled art inherent to the chosen event of discussion.
Materials	<ul style="list-style-type: none"> • Various recycled materials (e.g. plastic bottles, cardboard boxes, old fabric) • Art supplies (e.g. glue, scissors, paint)
Grouping and/or interaction	Teams

How to - Description	<p>1. Introduction (Elevator Pitch Exercise):</p> <p>The teacher will start with an elevator pitch exercise to engage learners and introduce the concept of upcycling. Learners will be given a short amount of time to pitch their ideas for upcycled art projects using recycled materials. This exercise will encourage creativity and critical thinking.</p> <p>2. Upcycled Art Exhibition:</p> <p>Learners will work in teams to design and create upcycled art pieces using the provided recycled materials and art supplies.</p>
Execution	



	<p>They will be encouraged to think creatively and come up with innovative ways to repurpose the materials into art.</p> <p>3. Business Model Canvas: As part of the activity, learners will also explore the business aspect of upcycling art. They will use the Business Model Canvas to identify key elements of their upcycled art business, such as target customers, value proposition, distribution channels, and revenue streams.</p> <p>4. Presentation and Discussion: Each team will present their upcycled art pieces and explain the ideas behind their creations. They will also discuss the environmental impact of their art and how it aligns with the principles of the waste hierarchy.</p> <p>5. Reflection and Conclusion: The activity will conclude with a reflection session where learners will discuss the challenges and benefits of upcycling art. They will also reflect on the importance of reducing waste and promoting sustainability through creative practices.</p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>The upcycled art pieces created by learners can be showcased in an art exhibition at the school or a local community centre. This exhibition can be an opportunity to raise awareness about upcycling and promote environmental sustainability. The art pieces can be sold, and the proceeds can be used to fund further upcycling projects or donated to environmental organisations.</p>
<p>Extra activities</p>	<ol style="list-style-type: none"> 1. Upcycled Art Workshop: Organise a workshop where learners can teach younger students or community members how to create upcycled art. This will not only spread awareness but also encourage a culture of upcycling in the community. 2. Upcycling Design Competition: Host an upcycling design competition among different classes or schools. Learners can come up with innovative upcycled products, and a panel of judges can evaluate and award the best designs. <p>Resource:</p>



	<p>4 Eco friendly Artists on Sustainable creativity https://www.singulart.com/en/blog/2022/04/06/4-eco-friendly-artists-on-sustainable-creativity/</p> <p>A Guide to Sustainable Art https://www.countryandtownhouse.com/culture/sustainable-art-guide/</p>
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8. HOW TO ASSESS UPCYCLING

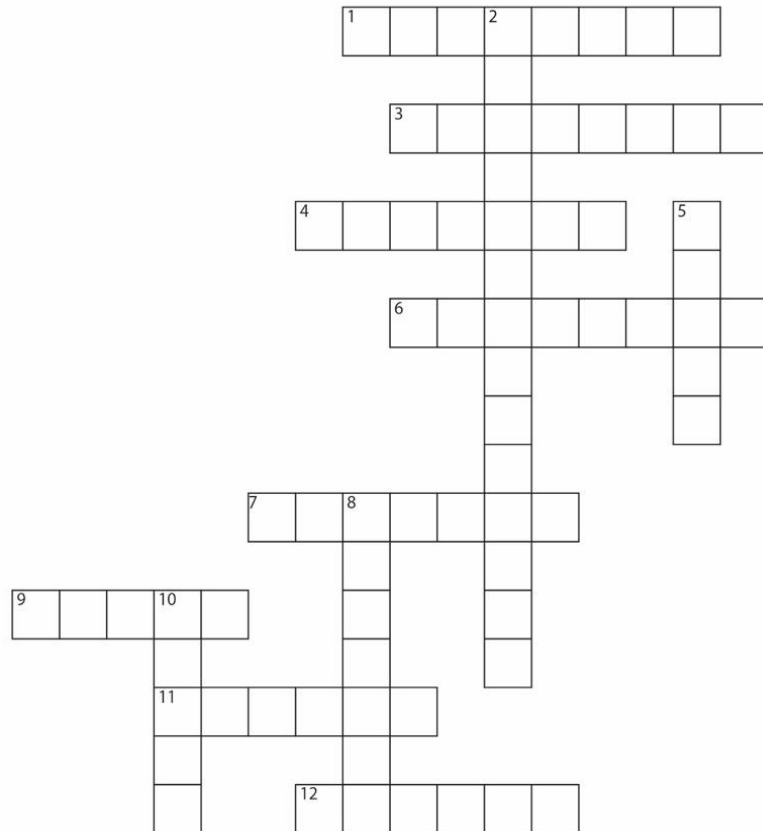
Activity 15: Vocabulary crossword

Activity number 15	
Name of the activity	Vocabulary crossword
Introduction of the topic/	<p>This activity focuses on upcycling and by teaching students more about this topic, we can help them to develop the vocabulary they need to take part in important dialogues around sustainability in the future and help them understand that they can do their bit to make their world greener.</p> <p>This crossword contains key terms related to a specific topic, and is designed to help students familiarise themselves with the terminology. In this crossword, students will encounter words that relate to the concept of upcycling.</p> <p>Duration: 45 minutes approximately</p>
Age group/Level	<p>ISCED 2 = Lower Secondary Education ISCED 3 = Upper Secondary Education</p>
Learning Objectives	<p>By the end of the activity students will:</p> <ul style="list-style-type: none"> • Raise awareness of upcycling and sustainability issues; • Reviews and learn vocabulary related to upcycling; • Develop creativity and critical thinking; • Develop communication and collaborative skills <p>Develop speaking and reading skills</p>
Materials	<p>The teacher will need:</p> <ul style="list-style-type: none"> • The Upcycling worksheet (one per learner)
Grouping and/or interaction	Pairs or Teams
How to - Description Execution	<p>a. Give each students a copy of the Upcycling worksheet; b. Separate students into pairs to do activity 1 – the crossword;</p>



c. When they finish, ask them to compare their answers with another pair, before providing the answers from them to check

Crossword



Across

- 1. Protect something from harm (v)
- 3. Supply of materials (n)
- 4. Get rid of something (v)
- 6. Area filled with waste material (n)
- 7. Change waste into reusable stuff (v)
- 9. Use something again (v)
- 11. Keep something from being lost or thrown away (v)
- 12. Make something again (v)

Down

- 2. Avoidance of depletion of a natural resource to keep an ecological balance
- 5. What something is worth



	<p>8. Eat or buy 10. Small amount of something left over</p> <p><i>Answers:</i></p> <p><i>Across: 1. conserve, 3. resource, 4. discard, 6. landfill, 7. recycle, 9. reuse, 11. rescue, 12. remake</i></p> <p><i>Down: 2. sustainability, 5. value, 8. consume, 10. scrap</i></p>
<p>Use of the device you created - sustainability of the artefact</p>	<p>Encourage students to try out one of the ideas at home and share with more friends and to create their own crossword for transferring knowledge regarding upcycling.</p>



Activity 16: Educational Critical thinking game

Activity number 16	
Name of the activity	Educational Critical thinking game
Introduction of the topic/	<p>This activity is focusing on a game designed to help students practise their speaking, creative and critical thinking skills by encouraging them to think on their feet. In this game, they will have to share their thoughts or opinions about upcycling for a specific amount of time.</p> <p>A fun way to improve their speaking, creative and critical thinking skills and build their confidence and teamwork.</p> <p>Duration: 45 minutes approximately</p> <p>By the end of the activity students will:</p> <ul style="list-style-type: none"> ● Raise awareness of upcycling and sustainability issues; ● Reviews and learn vocabulary related to upcycling; ● Develop creativity and critical thinking; ● Develop communication and collaborative skills ● Develop speaking and reading skills
Age group/Level	ISCED 1 = Primary Education
Learning Objectives	<p>By the end of the activity students will:</p> <ul style="list-style-type: none"> ● Raise awareness of upcycling and sustainability issues; ● Reviews and learn vocabulary related to upcycling; ● Develop creativity and critical thinking; ● Develop communication and collaborative skills <p>Develop speaking and reading skills</p>
Materials	<p>The teacher will need:</p> <ul style="list-style-type: none"> ● The Critical thinking game (one per pair/ team)
Grouping and/or interaction	Pairs/ Teams
How to - Description Execution	<p>Organise students into pairs, A and B. Give each pair a copy of the Upcycling speaking game and explain how to play.</p> <p>How to play</p>



- Player A = blue, Player B = red
- Players take turns to choose a word in the grid. To 'win' the hexagon, they have to share a good idea about how to upcycle the object, describing what you need and the steps you need to take. If they are able to do this, they win the hexagon and colour it in their colour (red or blue).
- The object is to make a joined-up line of hexagons either horizontally (Player A) or vertically (Player B).
- As the game proceeds, players will try to block their opponent's path while meandering to complete their own path.
- The winner is the first player to make a complete horizontal or vertical line.

Template:



Use of the device you created - sustainability of the artefact

Encourage students to try out one of the ideas at home and share with more friends and to create their own game for transferring knowledge regarding upcycling.



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