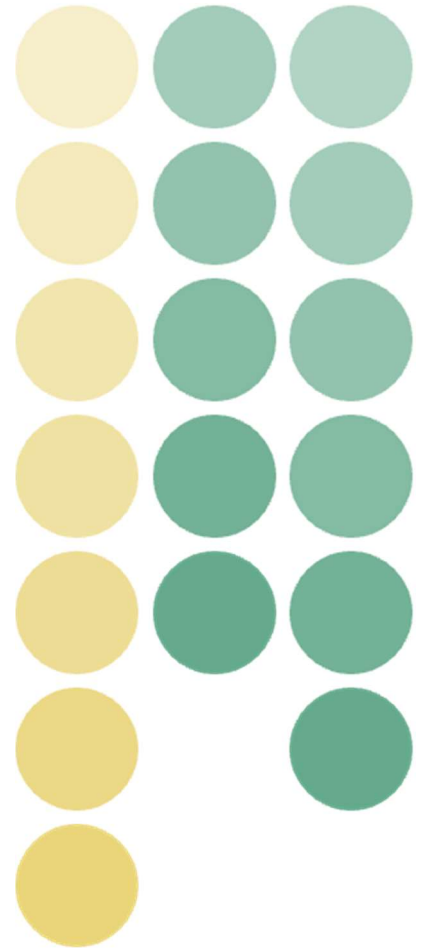# UpCycling:

THE IMPORTANCE OF UPCYCLING - COURSE FOR EDUCATORS

Table of Contents

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1.Environmental challenges

Environmental issues are global challenges that we need to understand to react and influence. In this module, we will review the challenges the earth is facing, and how they are met. The students will be able to understand the core concept of environmental challenges, and why there is a problem, and give them ideas on how they can be a part of the solution.

Learning outcomes

After reading this module…

- The reader can identify various environmental issues in a broad sense.
- The reader will be able to identify why we face these challenges on Earth and the general causes of environmental issues
- The reader can present possible solutions to the problem and encourage changes in consumption patterns and lifestyles

Content

1.1. Definition of Environmental challenges/issues

In general, environmental challenges/issues are the crises in the environment that have the potential to harm either man or his environment.

The primary environmental issues of today are systemic and cannot be solved on their own. Essentially, for simplicity, environmental challenges/issues can be divided into three linked categories: climate issues, biodiversity loss (nature issues), and pollution (chemicals and pollution issues). These three categories are endangering the economic and social well-being of the world. All of which points to a variety of connections, both direct and indirect, between environmental issues (The United Nations Environment Programme, 2021).

Our ecological footprint is a measurement of human demands on the Earth's natural resources. We currently use the equivalent of 1.5 Earths to produce all of our renewable resources. As the human population grows, the need to reduce our carbon footprint becomes more pressing (World Wildlife Fund, n.d.).

1.2. What are the main environmental issues?

What causes them and why are we facing these challenges?
In a world where constant temptations and advertising promote consumerism and irresponsible consumption, the need for raw materials to produce new things increases. People buy more and buy new to a much greater extent than reuse and renew. If this pattern does not change, the environmental

impact will be greater and create more problems for our planet and us who live on it. This is just an example of what causes environmental challenges/issues.

Climate change

Long-term changes in temperature and weather patterns are referred to as climate change. These changes might be natural, such as oscillations in the solar cycle. Nevertheless, since the 1800s, human activities have been the primary cause of climate change, owing primarily to the use of fossil fuels such as coal, oil, and gas. The combustion of fossil fuels emits greenhouse gases, which behave like a blanket wrapped over the Earth, trapping the sun's heat and boosting temperatures (United Nations, n.d.).

Source: link_image1

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Man-made emissions of greenhouse gases cause climate change, and the consequences of these changes on Earth include melting glaciers, rising sea levels, disrupting ecosystems, and increasing extreme weather conditions. In addition, there will be changes in the living conditions in the sea due to changes in currents, acidity, and salinity. It is not possible to know with certainty all the consequences that climate change has on humanity, but it is clear that the increased emission of greenhouse gases disturbs the balance that otherwise existed before the industrial revolution (The Environment Agency of Iceland, n.d.).

Examples of climate change

- Mean temperature rise
- Intense droughts
- Water scarcity
- Severe fires/wildfires
- Rising sea levels
- Flooding
- Melting polar ice and glaciers
- Catastrophic storms

Nature issues

Natural resource exploitation often causes disturbance and changes in the diversity of species and habitats. The term "biodiversity" refers to all living organisms present in the atmosphere, on land, and in water. From the smallest bacteria in the soil to the largest mammal in the ocean, all species play a function and produce the earth's ecosystem on which humans rely (European Environment Agency, 2010).

Examples of Natural issues

- Biodiversity loss

- Deforestation and forest degradation

- Desertification

- Soil erosion and degradation

- Overfishing

- Invasive species

Chemicals and pollution

Nearly every societal sector relies on chemicals and waste and safeguarding both human and environmental health depends on their wise management.

Pollution and waste are significant environmental issues that have serious consequences for human health, wildlife, and the natural world. Pollution refers to the release of harmful substances, such as chemicals, gases, or particulate matter, into the air, water, or soil, while waste refers to the production of materials that are not needed and are discarded (Britannica, n.d.).

Pollution and waste can have severe impacts on the environment. For example, air pollution can cause respiratory problems, while water pollution can harm aquatic life and make water unsafe for human consumption. Waste can also contribute to environmental degradation, such as through the creation of landfills or the accumulation of plastic in oceans.

Source: link_image2

To address these issues, individuals, businesses, and governments can take steps to reduce pollution and waste. This may include measures such as using alternative energy sources, improving waste management practices, and implementing policies to reduce the use of harmful chemicals. By taking action to reduce pollution and waste, we can help protect the environment and create a healthier and more sustainable future (National Geographic, 2022).

Examples of chemicals and pollution
- Fossil fuels
- Plastics
- Microplastics
- Waste management
- Toxic waste

- E-waste

- Pesticides

- Marine pollutants and marine debris

1.3. Possible solutions and mitigation actions. What solutions are countries/regions/individuals using and can upcycling be part of the solution?

Humanity will inevitably have to change its way of thinking and its way of life to prevent further environmental impacts that have a declining effect on life on Earth.

The classroom is the ideal setting for teaching the next generation about environmental concerns and what each person can do to lessen their effects. By making environmental education an integral part of the school, students learn about the issues at hand and are motivated to apply their skills and environmental awareness at home and actively participate in society for a more sustainable future. For instance, if students recycle everything, conserve water, and switch off lights and appliances when finished using them at school, they are more likely to do the same at home, inspiring the rest of the family to follow. But what about upcycling, could upcycling principles be applied in everyday school work and part of the sustainable strategies of the school?

Example

Here are some global solutions and mitigation actions that could be brought up in class:

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Circular Economy

A circular economy involves marketplaces that encourage the reuse of products and things rather than their scrapping and subsequent resource extraction.

All types of garbage, including discarded clothing, scrap metal, and outdated electronics, are recycled or put to better use in such economies.

This may offer a method to build new industries, employment, and capabilities in addition to protecting the environment and using natural resources more responsibly (Attafuah et al., n.d.).
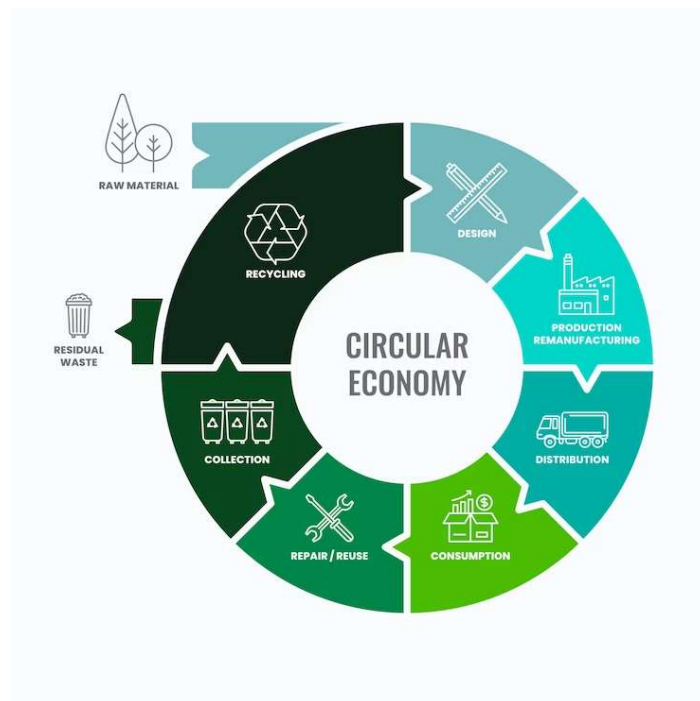
Source: link_image3

Could the school or classroom establish a circular economy within the school or near society for demonstration purposes?

Responsible consumption and production

An approachable topic for the young generation regarding environmental issues and an opportunity to engage the youth to estimate how responsible their consumption is and what they can do to promote sustainability and responsible consumption behaviour by themself.

Alternative fuels and renewable energy sources

Alternative fuels refer to non-traditional sources of energy that can replace conventional fuels such as gasoline, diesel, and coal. They are typically derived from renewable energy sources such as biomass, wind, and solar power. Some examples of alternative fuels include biodiesel, ethanol, hydrogen, natural gas, and propane.

Renewable energy sources, on the other hand, refer to sources of energy that are replenished naturally over time, such as solar, wind, hydro, geothermal, and biomass energy. These sources of energy are considered to be sustainable because they do not deplete natural resources and are less harmful to the environment than conventional energy sources.

The use of alternative fuels and renewable energy sources is becoming increasingly popular as people become more aware of the impact of conventional fuels on the environment. These sources of energy are seen as more sustainable and environmentally friendly, and as technology improves, they are becoming more cost-effective and accessible to consumers.

UN Sustainable development goals

The Sustainable Development Goals (SDGs), sometimes referred to as the Global Goals, were enacted by the United Nations in 2015 as a global call to

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action to eradicate poverty, safeguard the environment, and guarantee that by the year 2030, peace and prosperity will be experienced by everyone (United Nations Development Programme, n.d.).

Which goals could the school commit to and thus participate in the SDGs?

Reuse, reduce, recycle, and upcycle

Reduce: This refers to reducing the amount of waste we generate in the first place by using fewer resources and being mindful of what we buy and consume.

Reuse: This means finding ways to use items multiple times instead of throwing them away after a single use. This can involve repurposing items, repairing them, or donating them to someone else who can use them.

Recycle: Recycling involves taking materials that would otherwise be thrown away and processing them to create new products. This reduces the amount of waste going to landfills and conserves natural resources.

Upcycle: Upcycling is taking waste materials or unwanted products and turning them into something new and valuable, often with a higher quality or usefulness than the original item. This approach reduces waste and promotes creativity and innovation.

In a nutshell

Environmental challenges can be an overwhelming concept for children but with a common understanding of the issues, teachers can help them gain

awareness and the ability to assess their environmental footprint. It is certainly an opportunity for educators to cultivate the minds and responsibilities of the next generation by integrating environmental education and environmentally friendly activities into the everyday curriculum.

Food for thought

- In what ways can the students minimise the classroom's environmental footprint?
- Which Sustainable Development Goals are relevant for the school to implement?
- What are the main environmental issues affecting my country/region/city/town?
- What challenges might teachers and educators face when implementing environmental education?
- Could the school or classroom establish a circular economy within the school or near society for demonstration purposes?

Extra resources

Examples of global environmental threats-

https://www.worldwildlife.org/threats

Reduce, Reuse and Recycle: UNICEF-ICELAND Educational Video from 2018 (English subtitles) - https://www.youtube.com/watch?v=Tdy0k8LSIXQ

Earth.Org is a global non-profit environmental organisation. Kids.earth.org is their platform to educate the next generation to be more mindful of the choices they make and how they will affect the future of the planet. -

https://kids.earth.org/

Earth School was co-created by UNEP and Ted-Ed to provide kids, parents, and teachers all over the world with engaging nature-focused content to stay connected to nature during the global COVID-19 pandemic. -

https://www.unep.org/explore-topics/education-environment/what-we-do/earth-school

Youth, education and environment program by UNEP -

https://www.unep.org/explore-topics/education-environment

Eco-Schools program encourages young people to engage in their environment by allowing them the opportunity to actively protect it. - https://www.ecoschools.global/

1. Which of the following best describes climate change?

A) Natural variation in the Earth's weather patterns.

B) Long-term changes in the average temperature and weather patterns of the Earth are mostly caused by human activity.

C) Temperature and precipitation variations throughout the year.

D) Weather changes produced by volcanic eruptions in the short term.

2. Which of the following are possible solutions to environmental issues?

A) Investing in renewable energy sources

B) Increasing carbon emissions

C) Ignoring environmental regulations

D) Expanding the use of single-use plastics

3. Which of the following is considered one of the main environmental challenges facing the world today?

A) Increased levels of greenhouse gas emissions

B) Rapid population growth

C) Deforestation and habitat loss

D) Water scarcity and pollution

E) All of the above
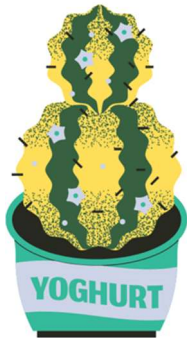
Glossary of terms

Environmental Challenges/Issues - Crises in the environment with the potential to harm humans or the environment. These challenges encompass climate issues, biodiversity loss (nature issues), and pollution (chemicals and pollution issues).

Ecological Footprint - Measurement of human demands on Earth's natural resources, often expressed as the number of Earths needed to sustain current resource consumption.

Climate Change - Long-term changes in temperature and weather patterns, primarily driven by human activities, including the combustion of fossil fuels.

Greenhouse Gases - Gases emitted from human activities that trap heat in the Earth's atmosphere, contributing to climate change.

Biodiversity - The variety of all living organisms present in the atmosphere, on land, and in water.

Pollution -The release of harmful substances into the air, water, or soil, with significant consequences for human health and the environment.

Circular Economy - An economic system that promotes the reuse and recycling of products and materials to minimise waste and resource extraction.

Responsible Consumption and Production - A sustainable approach that encourages individuals to assess their consumption habits and make choices that promote sustainability.

Alternative Fuels - Non-traditional energy sources derived from renewable resources, such as biomass, wind, and solar power, as alternatives to conventional fuels.

Renewable Energy Sources - Sustainable sources of energy replenished naturally over time, including solar, wind, hydro, geothermal, and biomass energy.

UN Sustainable Development Goals (SDGs) - A set of global objectives established by the United Nations to address various social, economic, and environmental issues by 2030.

Carbon Footprint - The total amount of greenhouse gases, primarily carbon dioxide, emitted directly or indirectly by an individual, organisation, or activity.

Ecosystem - A community of living organisms and their interactions with each other and their physical environment.

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Sustainable Future - A future characterised by responsible resource use, environmental conservation, and equitable development to meet the needs of present and future generations.

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2.Key concepts and benefits of upcycling

Nowadays, when mass production dominates and people have access to a wide variety of products, it is worth considering how to help our planet to combat excessive waste production and reduce consumption. In this module, we will learn about one of the modern and at the same time ecological methods of dealing with unwanted objects, that is **upcycling.**

Learning outcomes

After reading this module…

- The reader will **understand the importance of upcycling and its benefits**
- The reader will be able to **explain the impact of upcycling on creativity**.

Content

2.1. What does upcycling mean?

The term *upcycling* originated in the 1990s and **means 'reuse (discarded objects or material) in such a way as to create a product of higher quality or value than the original'** (Oxford English Dictionary, 2016, Wegener, 2016). Upcycling activities are influenced by the particular social, economic and political context in which they take place. Two extremes are upcycling driven by the necessity to meet basic human needs, for example, using waste materials to construct shelters in informal settlements, and upcycling as an art or craft to make objects of beauty. The economic, cultural and geographic context in which upcycling takes place influences the availability of raw materials, the end goal, and the creative influences and skills which shape the manipulation and re-purposing of the materials (Bridgens, 2018).

Source: https://www.pexels.com/pl-pl/szukaj/upcycling/
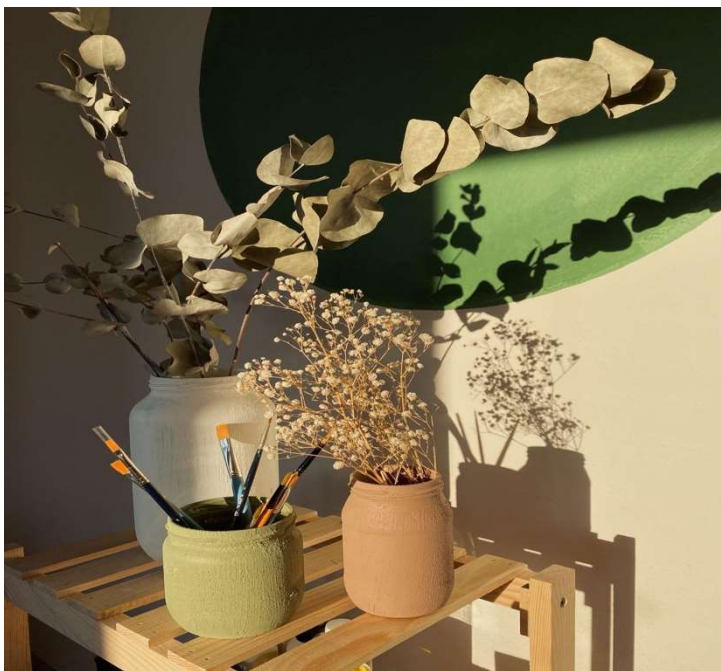
Short-term usage of products and disposable packaging result in premature disposal of valuable resources. Industrialisation, mass production, and global supply chains have resulted in an excessive production of unnecessary waste. **Upcycling is the reuse of discarded materials which results in an increase in 'value'.** Upcycling is the process of transforming unwanted waste materials into new products perceived to be of greater quality and value. **Upcycling is based on the 3Rs- reduce - reuse - recycle. The main motto is "Recycle waste as much as you can, do not send it to landfills".** In other words, upcycling is a kind of recycling but done in a creative way.

2.2. Benefits of upcycling

Upcycling is based on sustainable consumption, and the main idea is to revitalise old material by placing it into new products and by suggesting new ways of using it while, at the same time, keeping its essence intact as a main value-adding feature of the process.

Upcycling has got many benefits and positive impacts:

3. **Benefits of upcycling on the environment**

- **Reducing the amount of waste sent to landfills.**

We purchase items rapidly just as we dispose of them quickly due to our familiarity with the rapid mass production of goods. The primary issue related to landfills revolves around the release of methane, which is among the most potent greenhouse gases. Methane has a greater capacity to trap heat from the sun compared to carbon dioxide, and this characteristic makes it a significant contributor to climate change.

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- **Preventing landfill usage**

In contemporary times, numerous companies and designers are crafting stylish and functional items from vintage materials, which serves as an effective means to avoid landfill utilization.

- **Minimal resource consumption**

By recycling existing resources, we can manufacture goods without tapping into new raw materials. For instance, it's worth noting that creating a single t-shirt requires a staggering 2,700 liters of water.

The environmental advantages of upcycling are substantial. It not only reduces the volume of waste sent to landfills annually but also diminishes the necessity for new material production. This, in turn, leads to reduced air and water pollution, lower greenhouse gas emissions, and often results in the conservation of resources.

3. The economic and social gains

- **Supporting local and rural enterprises**

Upcycling also lends support to rural village industries and small local businesses, which carries positive social and economic impacts.

- **Reduced production expenses**

Employing reused materials in product creation can significantly cut down a designer's manufacturing costs.

3. Individual benefits

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- **Nurturing creativity and imagination**

By repurposing old items, we stimulate our creativity and imagination, fostering personal growth in the process.

- **Enhanced repair skills**

Restoring and breathing new life into items requires skill and offers a sense of accomplishment.

- **Unique merchandise**

Whether individuals engage in upcycling themselves or purchase items from designers, the appeal of having truly unique products is always a plus.

- **Encouraging upcycling in education**

It is advisable to introduce upcycling to young learners at an early stage. Initiating such education early on can yield future benefits, as students possess rich imaginations and innovative ideas for transforming and reusing items.

Source:

https://www.istockphoto.com/pl/search/2/image?mediatype=&phrase=upcycling&istockcollection=main%2Cvalue&page=2

If we start practising ecological behaviour , such as upcycling, at a young age, we have the chance to raise a society that is environmentally aware and willing to do things that protect the planet. Moreover, such a society will be creative, full of ideas and eager to be eco-friendly.

2.3. How does upcycling affect creativity?

All everyday materials like plastic packaging, glass, metal, textiles, wood, aluminium, cardboard or tin can be used for upcycling, it just depends on imagination. It is much more meaningful to take something and put your own spin on it and make it your own instead of going out and buying something that somebody else did.

Almost everything can be upcycled; it just depends on human creativity.

There are numerous common materials which are reusable household items and can be upcycled:

- **Clothing and textiles** - most textiles can be used again and again to make newer clothing. Fashion sector needs constant creativity, so it is a good opportunity to develop it using upcycling.
- **Furniture** - broken pieces can be used in newer pieces of furniture or decor, or the entire piece can be reworked into a more functional set for your home.
- **Electronics** - they can be turned into other household items and decor instead of ending up in a landfill.
- **Plastics** - Increasingly, plastic unused items such as shoes or jewellery are being reused, giving them a newer, better look. Plastic jewellery is in high demand.
- **Glass-** glassware can be used to create more interesting household items, such as pots, jars for sauces and soups, or even as eco-friendly coffee cups, obviously using old items no longer needed.

Source: https://www.pexels.com/pl-pl/szukaj/upcycling/

Upcycling activities should encourage consumers to think creatively, to engage with the idea of the end use of a product (imagining the end use of an object by being inspired by original ideas).

In a nutshell

Upcycling aims to use less new raw materials and reduce waste by utilising those that already exist.

The most obvious benefit of upcycling is having less material make its way to landfills. Fewer materials ending up in landfills will contribute to the long-term health of our planet.

Another huge benefit of upcycling is using fewer natural resources. By using what we already have, we don't have to take away any more raw materials from our environment than is truly necessary.

A further advantage of upcycling is that it stimulates creativity and innovative thinking.

Food for thought

- How can students at school be involved in the upcycling process?
- How to encourage students and their families to upcycling activities?
- What objects would you like to reuse and give them second life?
- How creative you are. Take up the challenge and find out by using upcycling.

Extra resources

Upcycling article: What Is Upcycling, and How It's Good for the Earth

https://www.rd.com/article/upcycling/

Upcycling ideas: 65 Useful and Easy Upcycling Ideas for Every Skill Level

https://www.goodhousekeeping.com/home/craft-ideas/how-to/g139/genius-upcycling-ideas/

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https://www.sciencedirect.com/science/article/pii/B9780080993591000096

Upcycling ideas: 15 Brilliant DIY Upcycling Ideas | Turn Your Trash Into Treasure Super Easily!

https://www.youtube.com/watch?v=Yfwfb5VXlPY

UPCYCLING

Upcycling Ideas for Students

https://www.vistathink.com/upcycling-ideas-for-students/

DIY Upcycling Activities for kids

https://www.pbs.org/parents/upcycled-activities

Self-assessment

Mark the correct option:

3. What does upcycling mean?

a) process of changing waste into something of lower value

b) process of changing waste into something of higher value

c) process of putting waste in the landfills

d) process of segregating waste

2. Upcycling has many benefits. Which of these is not true about upcycling?

a) having less material make its way to landfills

b) by using what we already have, we reduce the extraction of raw materials

c) upcycled clothes are not fashionable and people are reluctant to wear them

d) upcycled clothes are fashionable and creating them demands creativity

3. Which household items can be upcycled?

a) furniture, glass, paper

b) furniture, plastic, aluminium

c) clothing and textiles, wood, electronics

d) all of the above
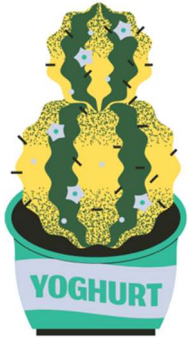
Glossary of terms

Upcycling - means 'reuse (discarded objects or material) in such a way as to create a product of higher quality or value than the original'.

End-use consumption - the process of reusing or upcycling products.

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https://www.habitat.org/stories/what-is-upcycling

3.How STEAM can be used for teaching upcycling to children

STEAM education (Science, Technology, Engineering, Art, and Math) is an interdisciplinary approach that integrates these subjects into a cohesive learning experience. This method integrates the subjects and focuses on their application to real-world situations.

Image source

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STEAM education emphasises creativity, innovation, and problem-solving skills by giving students opportunities to solve complex problems using critical thinking, inquiry, and design skills. It also promotes collaboration and teamwork, both of which are necessary skills in today's workforce.

Learning outcomes

After reading this module the learner will be able to address and tackle the following topics:

- Learners will seek to develop and enhance their **critical thinking and problem-solving skills,** as well as identify problems, generate and evaluate solutions, and make informed decisions.
- Through the integration of art and design, learners will be encouraged to **think creatively** and approach problems in new and innovative ways.
- Learners will take an active part in **collaboration and teamwork** and be encouraged to work effectively in teams, communicate ideas, and share responsibility for achieving shared goals.
- Learners will develop their **communication skills**, including the ability to explain complex ideas and concepts to others, as well as use a variety of media and technologies to communicate their ideas effectively.
- Learners will be provided with **technical skills** necessary to complete hands-on tasks in reusing and upcycling various materials, fabrics and compositions.

● Learners will develop **cultural awareness** and an appreciation for diversity through the integration of art and design, as well as understand and respect different perspectives and ways of thinking.

Content

3.1. A short introduction to STEAM

STEAM (Science, Technology, Engineering, Art, and Math) education is a great way to teach children about upcycling. Upcycling involves taking old or discarded materials and repurposing them into something new and useful. Among ideas that can be used to incorporate STEAM methodology in upcycling activities are:

1. Science: Teach children about the properties of different materials and how they can be reused. For example, plastic bottles can be used to make planters or bird feeders.

2. Technology: Use technology to show children how upcycling can be done. You can use websites, videos, or apps to show how to upcycle different materials.

3. Engineering: Encourage children to design and create their own upcycling projects. This can involve designing a plan for a project, creating a prototype, and then testing and refining it.

4. Art: Use art to inspire children to create upcycling projects. You can use examples of upcycling art to show them what is possible and then encourage them to come up with their own ideas.

5. Maths: Teach children about measurement, proportion, and other mathematical concepts that are needed for upcycling projects. For example, they may need to measure the size of a container to make sure it will fit the plants they want to grow.

By combining these STEAM principles, you can help children learn about upcycling in a fun and engaging way. This can help them develop important skills like problem-solving, critical thinking, and creativity.

3.2. STEAM in the Classroom

In the classroom, STEAM learning can look different depending on the age group, subject area, and the teacher's approach. Here are some examples of what STEAM learning can look like in the classroom:

Project-based learning

In a STEAM classroom, students may work on projects that involve designing, building, or creating something. For example, students might design and build a solar-powered car or create a stop-motion animation video.

Integration of art and design

STEAM classrooms often incorporate art and design into STEM subjects. For example, students might use drawing or graphic design software to create a blueprint for a 3D-printed object.

Hands-on experimentation

STEAM classrooms emphasise hands-on experimentation and inquiry-based learning. Students might conduct experiments, build prototypes, or test hypotheses to solve real-world problems.

simple machine
WINCH

[Image source](#)

Use of technology

STEAM learning often involves the use of technology, including computers, software, and other digital tools. For example, students might use coding software to create a game or program a robot to perform a task.

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Collaboration and teamwork

STEAM classrooms emphasise collaboration and teamwork, which are essential skills in today's workforce. Students might work in pairs or small groups to complete projects or solve problems.

Overall, STEAM learning is a dynamic and flexible approach that emphasises creativity, innovation, and problem-solving skills. In the classroom, STEAM learning can take many forms, but it always emphasizes hands-on experimentation, collaboration, and the integration of multiple subject areas to create a cohesive and engaging learning experience.

3.3. STEAM in recycling and upcycling

Active use of STEAM activities is the perfect way to introduce the concepts of recycling and upcycling in the classrooms, whereas learners are encouraged to adapt an interdisciplinary approach in an active and creative way. It focuses on the use of tools, knowledge of materials, team-collaboration, and out-of-the box thinking, all critical elements in STEAM education and necessary components of a successful upcycling project.

Here are some concrete STEAM recycling ideas that you can use to teach students about upcycling and sustainability:

1. Recycled paper crafts: Teach students how to make paper out of recycled materials like newspapers, magazines, or cardboard boxes. They can then use the paper to create art, journals, or cards.

2. Plastic bottle planters: Use plastic bottles to create unique and eco-friendly planters. Students can decorate the bottles and then use them to grow plants or herbs.

3. Upcycled fashion: Teach students how to repurpose old clothing by adding embellishments, altering the design, or using fabric scraps to create new pieces. This can include using tie-dye or fabric paint to create unique designs.

4. Junk art: Challenge students to create art out of everyday items like cardboard boxes, plastic bags, or tin cans. This encourages creativity and imagination while also promoting sustainable practices.

5. Electronic waste sculpture: Collect electronic waste like old phones, computers, and wires and use them to create a sculpture or artwork.

This can help students understand the environmental impact of electronic waste while also promoting innovation and creativity.

6. Composting: Teach students about composting and encourage them to create a compost bin or worm bin. This teaches them about the importance of recycling organic materials and can also be used to create nutrient-rich soil for gardening projects.

These are just a few STEAM recycling ideas that can be used to teach students about upcycling and sustainability. By integrating art and design into STEM subjects, students can develop a holistic understanding of sustainability and learn to think creatively about how to reduce waste and promote a more sustainable future.

Image source

3.4. What are the benefits of using STEAM in upcycling?

What solutions are countries/ regions/ individuals using and can upcycling be part of the solution?

Let's go back to the key issues in STEAM education (critical thinking, creativity, awareness, skill development and collaboration) and take a closer look at how each of these activities can connect us with and teach us more about upcycling and recycling:

Critical thinking

STEAM education promotes critical thinking skills, which are essential for solving complex problems such as those related to sustainability and waste reduction. When children learn about upcycling and recycling, they develop critical thinking skills by analysing and evaluating different materials and ways to reuse them creatively.

Creativity

STEAM education emphasises creativity and innovation, which is especially important when teaching children about upcycling and recycling. By using a combination of art and engineering, children can learn to transform waste into useful products, which fosters creativity and imagination.

Awareness

By using STEAM to educate children about upcycling and recycling, we promote environmental sustainability. Children can learn how to reduce waste,

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recycle materials, and make sustainable choices that will benefit the environment.

Skills development

Using STEAM to teach upcycling and recycling provides children with hands-on opportunities to develop STEM skills such as engineering, coding, and data analysis. These skills are essential for success in the 21st century workforce and can be applied in many fields, including environmental science and sustainability.

Teamwork and collaboration

Upcycling and recycling projects often require teamwork and collaboration. Children can learn how to work together to solve problems and create innovative solutions, which prepares them for future work environments.

Overall, using STEAM to educate children about upcycling and recycling provides many benefits. It encourages critical thinking, fosters creativity, enhances sustainability awareness, develops STEM skills, and improves teamwork and collaboration. By teaching children about these important topics, we can inspire them to make sustainable choices and create a better future for themselves and the planet.

In a nutshell

STEAM education is an interdisciplinary approach that focuses on creativity, innovation, and problem-solving skills to teach upcycling to children. STEAM principles can help children learn about upcycling in a fun and engaging way, developing important skills like problem-solving, critical thinking, and creativity. STEAM learning is a dynamic and flexible approach that emphasises creativity, innovation, and problem-solving skills. STEAM activities can be used to teach students about upcycling and sustainability, such as recycled paper crafts, plastic bottle planters, upcycled fashion, junk art, electronic waste sculpture, composting, and more. These ideas can help students develop a holistic understanding of sustainability and think creatively about how to reduce waste.

STEAM education promotes critical thinking, creativity, awareness, skill development and collaboration to promote environmental sustainability and skills development. Using STEAM to educate children about upcycling and recycling has many benefits, such as encouraging critical thinking, fostering creativity, and developing STEM skills.

Food for thought

- Think about creative design challenges that require students to upcycle materials, e.g. where students could be tasked with designing a functional object using only recycled materials or creating a piece of clothing out of old fabrics.
- How can makerspaces (*a makerspace is a collaborative workspace inside a school, library, or separate public/private facility for making,*

learning, exploring and sharing that uses high tech to no tech tools)
be used to teach students about upcycling?

- How can various tools and materials be used to upcycle old furniture, scrap wood, or other materials into something new.
- How can you adapt science experiments to upcycling in the classroom? Science teachers can incorporate upcycling into their curriculum by having students conduct experiments using recycled materials. For example, students could build a solar-powered oven using an old pizza box or create a water filtration system using recycled plastic bottles.
- How can upcycling and STEAM be incorporated into art projects?
- How can teachers challenge students to use upcycled materials in their technology or engineering-focused projects? For example, students could create a robot using old computer parts or design a solar-powered charger using recycled materials.

Extra resources

There are many resources available for STEM (Science, Technology, Engineering, and Math) education. Here are a few examples:

1. **Khan Academy**: Khan Academy offers free online courses and tutorials in a variety of STEM subjects, including math, science, and computer programming. https://www.khanacademy.org

2. **Code.org**: Code.org provides free resources for teaching computer science, including lesson plans, tutorials, and games. https://code.org

3. **National Science Teaching Association**: The National Science Teaching Association provides resources for STEM teachers, including lesson plans, webinars, and professional development opportunities. https://www.nsta.org

4. **STEM Learning:** STEM Learning provides resources for teachers, students, and parents to support STEM education, including free resources and teacher training. https://www.stem.org.uk

5. **NASA STEM Engagement**: NASA STEM Engagement provides free resources for teachers and students to learn about space and aerospace engineering, including lesson plans, virtual field trips, and professional development opportunities.

   https://www.nasa.gov/learning-resources/stem-engagement/

6. **Discovery Education**: Discovery Education offers a variety of STEM resources, including lesson plans, videos, and virtual labs. https://www.discoveryeducationglobal.com/solutions/stem/

7. **STEM Toys and Games**: Many companies produce STEM toys and games, which can be a fun and engaging way to introduce children to STEM concepts. Examples include Lego Education, Snap Circuits, and LittleBits.

Self-assessment

Mark the correct option:

1. Which STEAM principle involves teaching children about measurement, proportion, and other mathematical concepts needed for upcycling projects?

a) Science: Understanding the properties of different materials.

b) Technology: Using websites, videos, or apps to demonstrate upcycling.

c) Engineering: Designing and creating upcycling projects.

d) Maths: Learning about measurement and mathematical concepts.

2. Upcycling has many benefits. Which of these is not true about upcycling?

In STEAM classrooms, hands-on experimentation and inquiry-based learning are not emphasized; instead, the focus is primarily on theoretical knowledge.

a) True

b) False

3. Which STEAM recycling idea involves repurposing old clothing by adding embellishments, altering the design, or using fabric scraps to create new pieces?

    a) Recycled paper crafts: Making paper out of newspapers, magazines, or cardboard.

    b) Plastic bottle planters: Creating unique planters from plastic bottles.

    c) Upcycled fashion: Repurposing old clothing with embellishments and fabric scraps.

    d) Junk art: Creating art from everyday items like cardboard boxes and plastic bags.

4. Which aspect of STEAM education is particularly crucial for solving complex problems related to sustainability and waste reduction, as mentioned in the text?

    a) Creativity: Emphasizing innovation in transforming waste into useful products.

    b) Skills development: Providing hands-on opportunities for STEM skills like engineering and coding.

    c) Teamwork and collaboration: Learning to work together on upcycling and recycling projects.

    d) Critical thinking: Analyzing and evaluating different materials and ways to creatively reuse them.
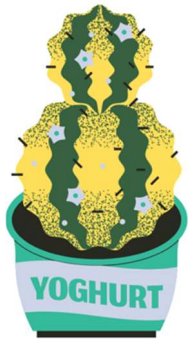
Glossary of terms

STEAM - An acronym for Science, Technology, Engineering, Art, and Math. STEAM education combines these subjects to foster interdisciplinary learning and real-world problem-solving skills.

Project-based Learning (PBL) - A teaching method in which students work on a project to explore a complex problem or question, often with the goal of producing a tangible product or outcome.

Design Thinking - A problem-solving methodology that emphasises empathy, experimentation, and iteration. It is often used in STEAM education to help students approach complex problems in a structured and creative way.

Maker Movement - A cultural trend that emphasises DIY (do-it-yourself) and DIWO (do-it-with-others) activities, often involving electronics, robotics, and other technology. It is often associated with the growing popularity of makerspaces and fablabs in schools and libraries.

Computational Thinking - A problem-solving approach that involves breaking down complex problems into smaller, more manageable parts and using algorithms and other computational tools to solve them. It is often used in computer science and other STEAM fields.

Coding - The process of writing instructions for a computer to follow. Coding is an important part of STEAM education because it helps students develop computational thinking skills and understand how technology works.

Robotics - The design, construction, and programming of robots. Robotics is an important part of STEAM education because it combines multiple disciplines, including engineering, programming, and mathematics.

3D Printing - A process in which a three-dimensional object is created by laying down successive layers of material. 3D printing is often used in STEAM education to teach design thinking, engineering, and other skills.

Augmented Reality (AR) - A technology that overlays digital information on the real world. AR is often used in STEAM education to create immersive and interactive learning experiences.

Virtual Reality (VR) - A technology that creates a simulated environment that users can interact with. VR is often used in STEAM education to create immersive and engaging learning experiences.

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Retrieved from: https://www.twinkl.com/teaching-wiki/steam-education

4. How to implement the design processes in the classroom

The demands of the 21st century require **Design Process skills** to solve a variety of problems in mostly networked and technological environments. The (Engineering) Design Process is an **enquiry-based approach to structuring learner-centred lessons and design challenges**. The following chapter explains how the Design Process can be applied to primary and secondary school teaching (STEAM learning environments).

Learning outcomes

After reading this module…

- The reader will be able to **name the steps** of the (Engineering) Design Process approach
- The reader will understand how the (Engineering) Design Process approach **can be employed in primary and secondary education**
- The reader will be able to **apply the (Engineering) Design Process approach** in a specific educational scenario.

Content

4.1. Design Process, what is it?

As trends such as globalisation and advances in artificial intelligence change the demands of the labour market and the skills needed for workers to succeed, people need to rely even more on their **uniquely human capacity for creativity, responsibility and the ability to have a lifetime of "learning to learn"** (OECD, 2019). The challenge for educators, then, is to create **learning environments that foster such skills**. Nowadays, innovative approaches to education are, fortunately, becoming more mainstream. One such example is the incorporation of **the Engineering Design Process (EDP) into teaching.**

As you have seen in **Module 3, STEAM** (Science, Technology, Engineering, the Arts and Mathematics) **education** is a learning approach that guides pupils to enquire, dialogue and think critically. **Any good STEAM lesson is based on enquiry, problem-solving and process-based learning** (Riley, 2022). The competences/learning processes outlined above can take place inside the context that is created by the **project and/or problem-based structure of EDP.**

So what is the EDP? Put simply, the EDP is a **tool to identify problems and develop solutions in a series of steps.** Architects, engineers, scientists and other thinkers use the design process to solve a variety of problems. In education, this **enquiry-based approach** is used to structure learner-centred lessons and design challenges.

4.2. Steps

The basic structure of the (Engineering) Design Process is a problem-understanding, problem-solving and evaluation process that enables effective problem-solving. However, the most widespread approach follows either a **5 or 7 steps approach**.

Usually, there are five steps in the design process: **1) Identify the problem 2) Brainstorming 3) Designing 4) Building, testing, evaluating and redesigning and 5) Sharing the solutions**. However, other formats include more steps or use different action verbs to reframe the enquiry process to arrive at a solution. An example of this is: **1) Ask 2) Research 3) Imagine 4) Plan 5) Create 6) Test 7) Improve (Repeat)**[1].

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[1] Source: https://www.teachengineering.org/PDF/edp/TE_EDPTeacherMaterials_8.5x11.pdf

UPCYCLING

As long as the process is done step by step and follows the basic structure, the verbs used are irrelevant. In detail:

IDENTIFY PROBLEM

BRAINSTORM

DESIGN

BUILD

REDESIGN

TEST & EVALUATE

SHARE SOLUTION

Step 1 - Identify the problem: It is not possible to find a solution (or several) if there is no clear idea of what the problem is, so the problem must be defined.

What problems are worth solving /understanding? What needs to be done? What is to be achieved? What are the needs? Where are the limits?
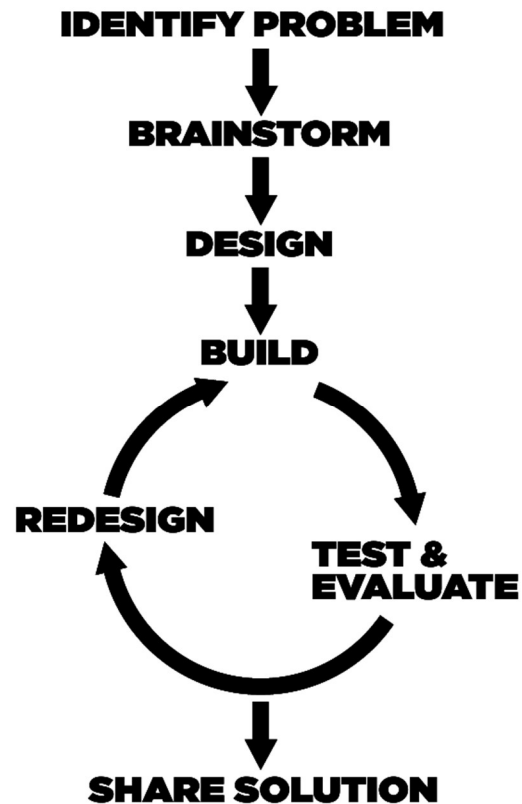
Step 2 - Brainstorming: Brainstorm to get inspired, gather information and outline a solution for the problem. This process is about collecting as many ideas as possible to outline solutions to the problem. Therefore, it is important to keep an open mind and avoid criticism.

Step 3 - Design: The step where the best ideas are compared. The goal is to choose a solution and create a plan to move forward with that solution. **How will the idea be turned into a plan?**

Step 4 - Building: Building a prototype turns ideas into reality! Once built, it needs to be tested and evaluated. Sometimes the solution goes through the design process again to refine it or even redesign it. **What materials are needed to create a prototype?**

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Does the prototype/solution work?

Step 5 - Sharing the solutions: Present the ideas to as many people as possible to get feedback so that the solution can be improved.

Does it solve the problem?

4.3. Advantages and Benefits of using the design process in the classroom

Authentic learning continues to play a major role in STEAM education as educators look for ways to connect the content taught in class with the real world and the use of EDP in the classroom is no exception. **Authentic learning can play a crucial role in implementing EDP in the classroom**, as pupils can try to solve real-life problems rather than the educator forcefully creating artificial problems. Moreover, problems act as a summative method for pupils to demonstrate to their teacher and classmates everything they have learnt thus far.

Likewise, EDP helps **educators take on the role of facilitator while pupils gain autonomy,** as it is often integrated into activities, projects, or problems that pupils can work on independently or in small groups (or as a class). Some could even argue that EDP creates an environment where pupils feel appreciated, **have control over their education, and have the chance to be responsible** is more important than giving any result of a standardised test (Fana, 2016).
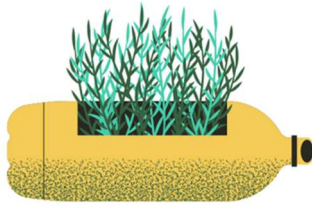
Example

Instant challenges are activity-based tasks developed in a short time frame that exercise pupils' problem-solving skills. The activities can be done individually or in teams and the **problem-solving challenge needs to be simple enough for pupils to find a solution in a short period**. Hands-on activities are most suitable.

Things to consider when implementing these types of activities:

- Manipulating items (e.g. cut or fold) makes the activity much more engaging. The use of (stationery) materials is essential, for example, for pupils to **build prototypes in class.**
- As with EDP, this type of activity always requires an **assessment exercise**. Adding closing questions, for example, is a great way to formatively assess student understanding (without grading).

Tip

Reusing, and recycling (even upcycling) items at school such as cans (drink cans), cups (yoghurt cups), and containers (baby wipe boxes) **saves a lot of money on classroom supplies and teaches good environmental habits**.

PROBLEMS
Ex. Solving World
Hunger, Creating
a New Energy Source.

PROJECTS
Ex. Science Lab Testing, Building Bird
Houses, Coding a Robot, Sewing a Pillow
Case, Crafting a Wooden Shelf.

ACTIVITIES
Ex. Graphing Points, Sketching, Debates, Following
Tutorial Videos, Investigating Simple Machines, Building
Simple Circuits, Using Water Colors, Learning Excel.

Ill-Defined

Facilitation

Well-Defined

Instruction

Source: Fana, E. (2016). Implementing Engineering Design into STEAM Learning Environments. KNILT. Retrieved from:

https://knilt.arcc.albany.edu/Implementing_Engineering_Design_into_STEAM_Learning_Environments

In a nutshell

To succeed in the 21st century, pupils need more than knowledge, they need the **ability to problem-solve**. Any good STEAM lesson is based on **enquiry, problem-solving and process-based learning.** The (Engineering) **Design Process is an enquiry-based approach** where pupils take control of their learning. This approach is a great tool for educators that helps them create **fluid, dynamic and relevant learning environments** that help pupils become **future-ready.**

Food for thought

- Does your current teaching practise efficiently prepare your pupils for the "real world"?
- Can you identify whether you use an Enquiry-based, Process-based or Problem-based approach in your teaching practise?
- If not, would you be *willing* and/or *able to easily* change your teaching approach?
- How can the (Engineering) Design Process be implemented in a Primary or secondary school classroom?

Extra resources

Enquiry-based exercises for primary and secondary school educators - https://ciblearning.org/inquiry-exercises/

STEM teaching resources for primary and secondary school educators- https://ciblearning.org/lesson-materials/student-activity-packs/+

Understanding the Design Process (Teaching Resource) - [video] https://www.pbslearningmedia.org/resource/adptech12.sci.engin.design.idsprocess/the-design-process/

Engineering-Design Aligned Curricula for primary and secondary education - https://www.teachengineering.org/curriculum/browse?EngineeringCategory=Full%20design

Compendium of hands-on science activities for the classroom and home (secondary education) - https://www.exploratorium.edu/snacks/snacks-by-subject

Instructional design models and theories (similar to the Engineering Design Process) - https://cognota.com/instructional-design-everything-you-need-to-know/

Self-assessment

1) The Engineering Design Process is:

A) A series of steps that guide *only* engineering teams to solve problems.

B) A tool for identifying problems and developing solutions, used in a variety of fields such as architecture, engineering and science.

C) A *STEM* learning approach that guides pupils to enquire, dialogue and think critically.

2) There are various steps in the Engineering Design Process, what are they? (more than one option is possible):

A) Empathise, Define, Research, Ideate, Prototype, Present your ideas, Improve

B) Ask, Research, Imagine, Plan, Create, Test, Improve

C) Identify the problem, Brainstorm, Design, Test and Evaluate, Redesign and Share Solutions

3) Enquiry-based, Process-based and Problem-based teaching are all learner-centred approaches in which educators act as facilitators and guides.

A) True

B) False
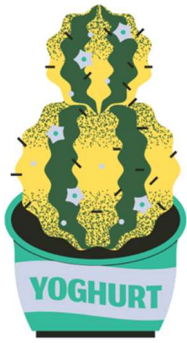
Glossary of terms

Learning to learn means having practical skills to participate in learning, taking control of one's learning (i.e. autonomy and the development of self-regulation strategies) and reflecting on and evaluating one's learning success (Cambridge University Press, 2019).

Process-Based Teaching or Process-Based Instruction (PBI) is defined as instruction that aims to teach thinking strategies and knowledge in context and coherence. PBI focuses on developing pupils' independence in learning and problem-solving by providing a structure in which curriculum activities can be embedded. The educator's role is to stimulate pupils' ability to learn new content through modelling or guided learning to gradually give them control over the learning processes.

Enquiry-based teaching/learning is a (pedagogical) approach that engages pupils in the exploration of academic content and making connections to the real world by asking, investigating and answering questions.

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5.Creating ideas related to art and music

Creating art from recycled materials is a creative and environmentally friendly way of reducing waste. It also allows for greater creative flexibility and enables people to express themselves in an original way. Turning everyday objects into art objects: There are many possibilities for transforming everyday objects into art. You can, for example, use old CDs, discarded furniture and even bottles to produce artwork. Examples: Old furniture can be used to create sculptures, CDs used to create murals, and even plastic bottles that can be used to create windmills. Create musical instruments with recycled materials: Making musical instruments from waste is an excellent way to express our creativity. The main materials used to make musical instruments are cardboard, wood, metal and plastic.

Learning outcomes

After reading this module…

- The reader will be able to **identify the potential of transforming everyday objects into art and music.**
- The reader will be able to **demonstrate the ability to create art and music from everyday objects.**

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● The reader will be able to **explain the importance of recycling and reusing materials for art and music.**

Content

5.1. Advantages of transforming waste in art

Source: link image1

Today's society generates an enormous amount of waste. As a result, recycling has become an essential action to protect the environment.

The environmental advantages of recycled art include, for example, **its contribution to the use and extending the useful life of materials and, as a consequence, by reducing the amount of waste generated**. It takes a great deal of creativity and a degree of technique to work with these materials.

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The benefit of transforming waste into art is that it enables people to be imaginative while reducing their impact on the environment.The waste can be converted into unique and beautiful works of art that have the potential to make a difference. This is not only an eco-friendly way of producing art, but it can also offer an excellent opportunity to re-use objects that have become useless. This can help reduce the amount of waste that goes to landfill, save natural resources and protect the environment.

By turning waste into art, we can also help protect the environment by reducing waste and environmental damage. It can be used to recycle materials that would otherwise be thrown away. The resources we use for upcycled art are often not materials that would otherwise be used. Bottles, plastic bags and other waste that would end up in rubbish dumps or floating in the sea become, in the hands of some artists, a form of sustainable art that draws attention to the deterioration of the planet and surprises with its originality. The possibilities go as far as the imagination can take us.

5.2. Transforming daily objects into art, some examples

Source: link image2

Recycled art is a form of visual art created through the conscious use of skill and imagination. It involves repurposing existing materials, such as found objects, discarded materials, and existing products, to create a new work of art.

This art form has been around for centuries, with examples ranging from Picasso's use of newspapers and matchboxes in his collages to today's contemporary artists incorporating plastic bags, bottle caps, and other everyday objects into their works. By reworking these materials, recycled art not only calls attention to excessive consumption and environmental pollution but also celebrates the potential of second chances and new beginnings.

Our waste deserves a second chance, and upcycling has led to the emergence of an artistic movement known as **recycled art – upcycled art or upcycling art –** that **is currently inspiring many artists** around the world with its critical message regarding excessive consumption and environmental pollution.

Some examples:

- A discarded pallet can be transformed into a beautiful wall art piece. https://pin.it/118FENZ
- Old tires can be recycled into plant pots. https://pin.it/4qbNDXj
- An old ladder can be repurposed as a bookcase. https://pin.it/3IBV7aV
- An old dresser can be painted and used as a TV stand. https://pin.it/58ukuMK
- An old bed frame can be repurposed into a garden trellis. https://pin.it/5hjlF0l
- An old window can be used as a picture frame. https://pin.it/7dBaHkn
- An old wooden chair can be used as a coat rack or hat holder. https://pin.it/5fOIIGo
- Empty bottles can be turned into a unique lamp. https://pin.it/6gKmvCY
- An old suitcase can be used as a unique storage solution. https://pin.it/46kwfOI
- An old door can be repurposed into a unique headboard.https://pin.it/2DEj3MW

5.3. How to create musical instruments with waste

Creating musical instruments with waste is a great way to keep items out of landfills and use materials that would otherwise be thrown away. Tin cans, plastic bottles, and cardboard boxes can all be used to create drums, guitars, and other instruments. For example, tin cans can be used to create a drum set, while cardboard boxes can be used to make a guitar. Plastic bottles can be used to make a flute or whistle. By creating musical instruments with waste, people can reduce their environmental impact and have fun making music simultaneously.

The learning outcomes for transforming everyday objects into art and music are to identify the potential of these items and demonstrate the ability to create art and music from them. People should be able to explain the importance of recycling and reusing materials for art and music, as well as understand the environmental impacts of creating art and music from waste. Through this, people can learn to be more creative and efficient with their use of materials, as well as reduce their environmental impact.

Example

Creating musical instruments from recycled materials is a great way to explore your creativity and develop new skills. Here are some examples of musical instruments you can make from everyday items you might have lying around the house:

1. **Make a drum from a plastic container and some rubber bands**. Secure the rubber bands around the container and use chopsticks or similar items as drumsticks.

2. **Create a rain stick out of a paper towel roll and some rice**. Cut the paper towel roll in half, fill it with rice and seal the ends with tape.

3. **Build a guitar from a cardboard box and some rubber bands**. Cut holes in the sides of the box and secure the rubber bands as strings.

4. **Construct a xylophone out of plastic cups and dowel rods**. Place the cups in order of size and secure the dowel rods in the tops of the cups.

In a nutshell

In order to help students thrive in the 21st century, teachers should create learning environments that not only impart knowledge, but also foster problem-solving skills. To accomplish this in an eco-friendly way, teachers can have students make art from recycled materials. This encourages creative expression, as well as reduces waste; old furniture, CDs and bottles can all be used to create art pieces, and musical instruments can be made from recycled materials.

Food for thought

- How can you bring ordinary objects to life and make them unique?
- How can you utilize upcycling art to create visually appealing and meaningful works of art?
- How can upcycled materials be used to create music?
- What does combining art and music through upcycling mean to you? How does it challenge your creativity?
- How could upcycling be used to teach students practical skills such as problem-solving and collaboration?

Extra resources

Upcycling Ideas: https://www.upcycled-wonders.com/upcycling-ideas/

Upcycling Ideas for Kids: https://www.pinterest.pt/nationalplt/upcycled-projects-for-kids/

 Musical Instruments from Recycled Materials:

https://www.pinterest.pt/candiceverga/musical-instruments-from-recycled-materials/

Upcycling Ideas for Music: https://www.pinterest.pt/theresa_vic/upcycle-music-instruments/

Making Music with Recycled Materials:

 https://www.youtube.com/watch?v=JHnVgej9LPo

Creative Reuse: https://www.creativereuse.org/

Self-assessment

Mark the correct option(s):

1) What is one advantage of transforming waste into art?

A) To reduce the amount of waste in the environment

B) It encourages creativity

C) It can be used to create beautiful works of art

D) All of the above

2) What is the purpose of transforming everyday objects into art?

A) To express creativity and imagination, to engage with viewers in a meaningful way, to challenge perceptions of the everyday, and to create something beautiful or meaningful.

B) To make a statement about society

C) To make a profit

D) All of the above

3) What materials can be used to make a musical instrument from waste?

A) Cardboard, plastic, and paper

B) Wood, metal, and glass

C) Fabric, foam, and rubber

D) All of the above
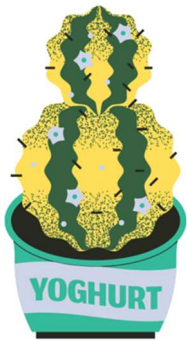
Glossary of terms

Trellis - A trellis is a structure made from materials such as wood, metal or other materials, designed to support climbing plants such as vines, ivy or roses. It serves as a structure for climbing plants to ascend vertically and is often used for ornamental purposes in gardens or to create privacy screens.

Ivy - Ivy is a common name for several species of climbing plants. These species are known for their characteristic dark green, shiny leaves and their ability to attach themselves to surfaces via aerial roots. Ivy is often used for decorative purposes in landscaping and can climb walls, fences and trees. practices such as recycling, upcycling, and closed-loop production.

Coat rack - A coat rack is a piece of furniture used to hang and store coats, hats and accessories.

Hat holder - A hat rack is an object designed to store hats, keeping them organized and accessible..

Rubber bands - Elasticated bands or straps designed to secure and maintain the shape of hats. These bands help prevent hats from losing their shape.

Dowel rods - Dowels are cylindrical rods, often made of wood, which are used in various carpentry applications.

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What are the advantages and disadvantages of upcycling?

https://www.linkedin.com/advice/1/what-benefits-challenges-using-recycled-1e#:~:text=Benefits%20of%20recycled%20art,gas%20emissions%2C%20and%20prevent%20pollution.

UPCYCLING

6.Materials that can be used for upcycling with children

Solid waste production is increasing dramatically on a global scale, creating an urgent need for alternative, environmentally friendly trash management methods (Omran et al. (2017). Almost 870,000 plastic bottles and 3.2 million plastic sachet fragments that may have ended up in landfills or as marine litter have been retrieved by the Pag-Asa sa Basura initiative. Initial qualitative evaluation of the program also revealed that it has improved kids' leadership and self-discipline as well as their awareness of plastic waste segregation and environmental responsibility at a young age (P&G And World Vision: Upcycling Plastic Waste Into School Chairs!, n.d.). Research conducted by Richey & Klein, (2014) suggests that there are some upcycling materials that can effectively be used for upcycling with children:

- Glass
- Ceramic
- Cardboard
- Wood
- Paper
- Styrofoam
- Clothes & other fabrics
- Candle holder
- Pin holder from leftover cupcakes paper cups

- Candy bottles from used plastic bottles
- Used pulp egg tray for wall decoration panel
- Magazines, glue, yarn, strips of discarded T-shirts
- Plastic bottles, paper towel rolls, brown paper bags

Learning outcomes

After reading this module:

- The reader will be able to implement an efficacious pedagogical method and a quick and straightforward way of learning about upcycling materials.
- The reader will understand how to decrease the production of waste and increase the effectiveness of resource consumption.
- The reader will motivate and empower students to use ordinary materials in a creative way.
- The reader will learn how to minimise the exploitation of natural resources.
- The reader will be able to properly recognise through practical paradigms how to use materials that best fit in a classroom.
- The reader will be able to test his newly acquired knowledge in multiple questionnaires.

Did you know that 2,700 litres of water are required to manufacture the cotton used to create just one t-shirt?

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UPCYCLING

Content

6.1. What materials are best for upcycling at school?

Very innovative repair, reuse, and repurposing are examples of craft-based upcycling that have long been practised by people. Prior to modern manufacture, many goods were frequently scavenged because of scarcity or utilised to the full extent of their material value (Fromm, 2013).

I. Children's upcycling and recycling habits can be developed by encouraging them to design and make useful objects out of waste materials, which is also a crucial component of maker activities. The majority of plastic toys are discarded, and those toys can be very dangerous to the environment and to people. When compared to pre-made plastic toys, upcycling activities can foster children's creativity and have a positive impact on the environment. Therefore, educating children about waste management through upcycling activities can be enjoyable and rewarding.

II. Younger students might learn more and have more fun by making new toys out of discarded household items than they would by purchasing new educational toys.

Best Materials for children that you can use in upcycling

- toilet paper rolls
- Glue
- String

- Some coloured paper, preferably in child's favourite colours

- Bubble wrap

- Mahjong paper or drawing paper

- Paper plate

- Newspaper

- Lots of paint!

- Marker pen

With the above materials you can repurpose lots of products and learn the process of upcycling. Some examples if you use the above materials are: Toilet paper binoculars, Stomp painting, Cardboard city, Ring toss game.

[Image.1] According to a 2017 study published in Science Advances, only 10% of all plastic ever produced is recycled (Hamers, 2019).

[Image.2] The majority of plastic ends up in landfills, while some gets recycled. Recycling-friendly plastics may be able to change that (Hamers, 2019).

[Image.3] **No sew zipper case** (Upcycling Plastic) (Pal, 2016)

[Image.4] **How to use upcycled plastic water bottles to produce vegetables** (2021).

[Image.5] **Plastic bottle pet feeder** (Pal, 2016).

Within Australia, approximately three-quarters of the rubbish along the coast is plastic.

I. It is frequently introduced a variety of unique, unconventional teaching products when it comes to upcycling at schools. A few of them are (Cox, 2020):

   ➢ Cans, cups, and containers (Crayons cans, etc.)
   ➢ Cartons, canisters and cardboard containers (Egg cartons, etc.)
   ➢ Bottles, baskets and boxes (Hair dye bottles, etc.)
   ➢ Pawns, paper towels and plastic lids (Water bottle tops, etc.)
   ➢ Additional material (Wrapping/shraded paper, hangers, etc.)

Plastic waste is a major contributor to climate change, and it's estimated that there will be more plastic in the ocean than fish by 2050.

6.2. What can you create with recycled materials with children?

By asking kids to keep all of their cans, cups, and containers, you can recycle at school on a budget and with ease.

Some common household goods can be reused in the following ways (Cox, 2020):

- Asking kids to save all of their egg cartons, coffee canisters, and cardboard containers for later reuse is another strategy to promote recycling at school.

[Image.6]**Egg cartons:** You can use egg cartons as a vase, a paint container, or a sculpture in addition to sorting stuff. Furthermore, it can be employed in a number of crafts (Team, 2021)

[Image.7] **Coffee canisters:** Students are suitable for use as game tokens or as storage for craft materials and art supplies(Coffee Cans, n.d.)

[Image.8] **Fast food cardboard wrappers** can be utilized for crafts or other special projects (Designboom, 2023).

You might also have cartons, plastic laundry bins, and hair colour or styling products containers around the house. Here are a few uses for them again:

[Image.9] **Baby wipe plastic boxes** may be utilized to hold everything, including pens, crayons, dice, coins, beads, chalk, buttons.(Home Decor for a Baby Wipes Box, n.d.)

[Image.10] **Cereal packages:** They can be sliced into tagboard, book covers, and painting surfaces (Jackson, 2019)

Water bottle caps made of plastic, as well as yoghourt and butter container lids, make excellent game components. Here are some other techniques for recycling and reusing paper towel rolls and plastic lids:

Recycling still produces carbon emissions

[Image.11] **Water bottle tops:** You can use water bottle tops as chess pieces. Make sure all of your pupils' water bottle caps are saved and collected. Use the clear tops as pawns in board games by painting them in various colors (Alves, 2014).

[Image.12] **Toilet paper and paper towel rolls** can be used to make crafts like a stargazer, a pair of telescopes, or a **birdfeeder** (2012)

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[Image.13] Birdfeeder (2012)

Gather plastic lids from coffee, yogurt, butter, or other items with a lid that fits so you can use them for crafts or in the learning center. Clear lids are ideal for question-and-answer sessions in the learning center. When utilized for crafts, lids can be made into Frisbees, coasters, frames, or plaques.

When you upcycle something, you reduce the need to extract raw materials or create synthetic materials because you already have what you need

Additional Ideas:

- Picture frames (Cardboard, rolled magazine pages, paint)
- Paper Bin (rolled magazine pages)
- Tic - Tac - Toe (Noughts and Crosses),
- Birthday Decorations (Wrapping paper, old magazines, cardboard, and paint)

6.3. What are some examples of upcycling with children in the classroom?

[Image.14]Upcycled Plastic Bottle Cap Keychain, (Upcycling Workshops – Terra SG, n.d.)

[Image.15]Upcycled Face Mask Pouch, (Upcycling Workshops – Terra SG, n.d.)

[Image.16]Upcycled Milk/ Juice Paper Carton Pouch, (Upcycling Workshops – Terra SG, n.d.)

[Image.17]Upcycled Milk/ Juice Paper Carton Planter Holder, (Upcycling Workshops – Terra SG, n.d.)

[Image.18]Upcycled Wallpaper/ Magazine Paper Wallet, (Upcycling Workshops – Terra SG, n.d.)

[Image.19]Upcycled Plastic Bottle Self-Watering Planter, (Upcycling Workshops – Terra SG, n.d.)

[Image.20]Upcycled Glass/Sauces Jar Snow Globe, (Upcycling Workshops – Terra SG, n.d.)

[Image.21]Upcycled Assorted Glass Bottle LED Lamp, (Upcycling Workshops – Terra SG, n.d.)

[Image.22]Upcycled Fabric Multi Holder,(Upcycling Workshops – Terra SG, n.d.)

[Image.23]Paper Bin, (Duric, 2021)
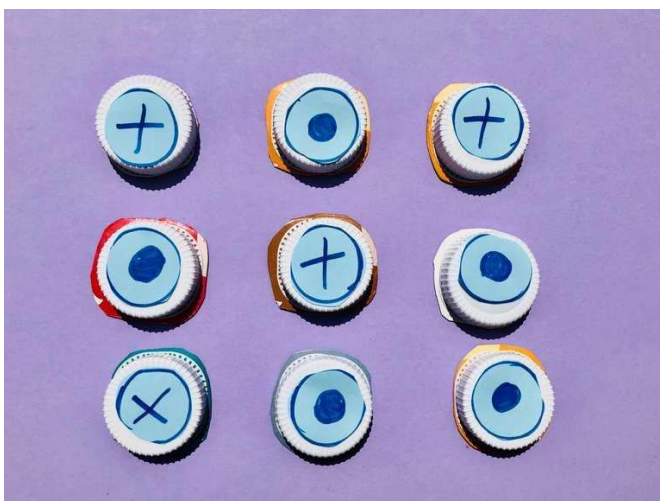
[Image.24]Tic - Tac - Toe, (Duric, 2021)

[Image.25]Picture Frame, (Duric, 2021)

In a nutshell

This module introduced to the reader which materials are most suitable for upcycling in a school setting along with innovative ideas to motivate and empower students and at the same time raise awareness on upcycling. It can be concluded that the benefits of plastic upcycling over traditional recycling are numerous. Recycling plastic generates an item with more carbon emissions, whereas upcycling plastic uses fewer resources.

Food for thought

What distinguishes Recycling from Upcycling?

Recycling entails turning garbage into fresh materials or products, <u>BUT</u> Upcycling gives the producer control over the process.

It is difficult to exaggerate how important and vital food is to our lives. Humans need food to survive, yet between one-third and one-half of the world's annual food output is lost or squandered, severely harming both people and the environment. Of all the important challenges confronting humanity is how to substantially reduce that waste, starting with the near-term global Sustainable Development Goal[i] of decreasing food waste by 50 per cent by 2030. This commitment must be met if we want to effectively nourish approximately 10 billion people by 2050 (Stevenmfinn, 2021).

We have normalised a significant amount of food waste with disrespect for residents who lack access to adequate nutrition and the environment in a society where food is widely available, reasonably cheap, and readily disposed of (Stevenmfinn, 2021b).

Extra resources

Resource for teachers, learners, extra information about the topic:

Wegener, C. (2016). Upcycling. Palgrave Macmillan UK EBooks, 181-188. https://doi.org/10.1057/9781137511805_22 , an interesting and rather innovative research paper regarding upcycling ideas and design spaces.

Non-credible sources:

Green Junkie (Green Junkie (buzzsprout.com) -a short podcast called The Green Junkie discusses sustainable and environmentally friendly lifestyle.

People Fixing Fashion - in this website you can find the knowledge on how to repair, upgrade and care for your clothes.

Upcycled Food becomes this year's latest food trend - YouTube, an interesting video regarding Upcycled foods are made from ingredients that would usually be thrown out. Now, they're further processed into marketable products, reducing food waste with a positive impact on the environment.

Self-assessment

Mark the correct option:

1. **What is the main objective of kid-friendly upcycling projects?**

   A) To turn waste materials into new and useful products

   B) To make money by selling recycled goods

   C) To gather as many recyclables as you can.

2. **Due to its adaptability and availability, which of the following materials is frequently used for upcycling crafts with kids?**
   A) Bottles made of plastic

   B) Packaging made of foam

   C) Shattered glass

3. **Why is it crucial to involve kids in upcycling projects?**

   A) It instils in them the importance of recycling and waste minimization.

   B) It enables them to create new products for use in commerce.

   C) It enables them to amass materials for individual use.

4. **Upcycling is**

   A) Turning trash into valuable objects

   B) Another name for recycling

   C) Turning trash into something less valuable

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7. Tips for upcycling entrepreneurs

In today's world, where sustainability is a growing concern, upcycling has emerged as a popular trend among entrepreneurs. **Upcycling** not only helps to reduce waste but also provides a **creative and profitable way to repurpose materials**. In this module, we will explore some essential tips for upcycling entrepreneurs to help them succeed in their endeavors.

Learning outcomes

After reading this module…

- Understand how to **manage waste production materials** efficiently and reduce their environmental impact while increasing profitability.
- Properly analyze different scenarios to **identify upcycling opportunities** and create sustainable products, thereby contributing to a circular economy.
- Identify the benefits of **upcycling as a creative tool for entrepreneurs** and apply it in their business practices.

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7.1. Introduction to entrepreneurship

Entrepreneurship is the process of creating and running a new business venture in order to achieve a profit or fulfill a social need. It is a challenging and rewarding undertaking that requires a certain set of skills and attributes, such as creativity, risk-taking, innovation, and resilience. Entrepreneurs can be found in a variety of industries, from technology and finance to hospitality and retail, and can operate businesses of all sizes, from small startups to large corporations. One of the key elements of entrepreneurship is identifying and satisfying a market need. This involves researching and analyzing potential customers, their preferences, and their pain points, and then developing a product or service that meets those needs. It also requires a deep understanding of the competitive landscape and the ability to differentiate oneself from competitors.

Source: [link image1](#)

Another important aspect of entrepreneurship is financial management. Entrepreneurs need to develop a solid understanding of financial concepts such as cash flow, profit and loss, and return on investment. They must be able to manage expenses and revenue effectively, and be prepared to adjust their strategy if financial projections do not meet expectations. Successful entrepreneurship also requires effective communication and networking skills. Entrepreneurs need to be able to pitch their ideas to investors, customers, and potential partners, as well as negotiate deals and contracts. Building a strong network of contacts and mentors can also be instrumental in the success of a new business.

Finally, entrepreneurs need to be adaptable and willing to pivot their business model as needed. Startups often need to adjust their strategy and focus based on market feedback and changes in industry trends. This requires a certain level of flexibility and resilience, as well as a willingness to learn from failure and iterate on ideas.

Overall, entrepreneurship is a complex and challenging field, but can also be incredibly rewarding for those with the right skills, mindset, and commitment. It offers the opportunity to create something new and meaningful, and to have a positive impact on the world.

7.2. Managing waste production material

Methods for Reducing Waste Production

One of the biggest challenges facing companies today is the management of waste production. The production of waste is not only harmful to the environment, but it can also be costly for businesses. There are, however, various methods that businesses can use to reduce the amount of waste they produce.

The Principles of the Waste Hierarchy: Reduce, Reuse, and Recycle

One of the most effective ways of reducing waste production is by following the principles of the waste hierarchy, which are reduce, reuse, and recycle. The first principle, reducing waste, involves taking steps to prevent or minimize the amount of waste produced. This can be achieved by improving production processes, changing product designs, or by implementing recycling programs.

The second principle, reuse, involves finding ways to use waste products for another purpose. This can be done by implementing closed-loop systems, where waste products are fed back into the production process, or by finding new markets for waste products.

Garbage Sorting

Source: [link image2](link_image2)

Finally, recycling is the third principle of the waste hierarchy. Recycling involves converting waste materials into new products, which can be sold or used within the production process. By following the waste hierarchy, businesses can minimize waste and reduce their environmental impact.

Examples of Waste Reduction Strategies for Production Processes

There are many waste reduction strategies that businesses can implement to reduce the amount of waste they produce. One example is implementing lean production processes, which aim to optimize production processes and minimize waste. This can be achieved by identifying areas where waste is being produced and finding ways to reduce it.

Another strategy is implementing product design for the environment (DfE) principles, which involve designing products that are environmentally friendly and produce less waste. This can include reducing the amount of packaging, using recycled materials, and designing products that are easy to disassemble and recycle.

Ways to Assess the Environmental Impact of Waste Production and Identify Areas for Improvement

To assess the environmental impact of waste production, businesses can use various tools and methods. One example is a life cycle assessment (LCA), which is a tool that can be used to identify the environmental impact of a product or process from raw material extraction to disposal.

Another method is conducting a waste audit, which involves analyzing the types and quantities of waste produced by a business. This can help to identify areas where waste reduction strategies can be implemented.

By using these tools and methods, businesses can assess the environmental impact of waste production and identify areas for improvement. This can help to reduce waste production and minimize the environmental impact of a business.

7.3. Upcycling as a creative tool for entrepreneurs

Upcycling is a creative and innovative approach to waste management that involves repurposing waste into new products with increased value. Upcycling differs from recycling in that it requires more creativity and results in a higher value product. Entrepreneurs can benefit from upcycling in a variety of ways, such as reducing costs, increasing competitiveness, and enhancing brand image.

To begin with, entrepreneurs must understand the principles of upcycling and differentiate it from other waste management practices such as recycling. Upcycling is a form of recycling, but it involves taking waste materials and creating new products with greater value, rather than simply breaking down the waste and reusing it. Understanding this difference is important for entrepreneurs who want to tap into the potential of upcycling.

In addition to the environmental benefits of upcycling, entrepreneurs can also benefit financially. **Upcycling can help to reduce costs and increase competitiveness.** By using waste materials that would otherwise be discarded, entrepreneurs can cut down on the costs of raw materials, which can increase their profit margins. In addition, upcycling can help to create unique and innovative products that stand out in the market and enhance brand image.

Entrepreneurs can find **inspiration** for upcycling projects through exploring upcycling success stories and examples. By studying what other businesses have done, entrepreneurs can learn about the potential of upcycling and get ideas for their own projects. It is also important to understand the different

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techniques and materials that can be used for upcycling, such as repurposing fabrics or turning waste into building materials.

Source: link image3

Market research is crucial when considering upcycling as a business opportunity. Entrepreneurs must identify their target customers, gauge interest, and explore potential markets for their upcycled products. This may involve creating surveys or focus groups to understand consumer preferences and needs.

Developing a business plan is another important step in upcycling as a creative tool for entrepreneurs. This includes considering start-up costs, revenue streams, pricing strategies, and distribution channels. It is important

to consider the unique aspects of upcycling, such as supply chain issues and quality control, when developing a business plan.

Upcycling can be a challenging yet rewarding process for entrepreneurs who want to turn waste into value-added products. However, there are several challenges to consider when incorporating upcycling into a business model. One of the primary challenges is dealing with supply chain issues, including sourcing materials and ensuring a consistent supply of raw materials. This may require building relationships with local waste management companies, recycling centers, or even collecting waste materials directly from consumers.

In addition to supply chain issues, managing quality control is essential when upcycling waste materials. The process of upcycling involves transforming waste into a new product with added value, which requires careful attention to detail to ensure that the final product is functional, durable, and aesthetically pleasing. Entrepreneurs may need to invest in specialized tools and equipment, as well as train employees on upcycling techniques to ensure that quality standards are met.

Another challenge that entrepreneurs may face is educating customers about the benefits of upcycling and the value of upcycled products. Upcycling is a relatively new concept, and many consumers may not be aware of its benefits. Entrepreneurs may need to invest in marketing and education efforts to raise awareness about the environmental and social benefits of upcycling and the unique value of upcycled products. Additionally, entrepreneurs may need to explore partnerships with retailers or create their own e-commerce platform to sell their products and reach a broader customer base.

Overcoming these challenges requires careful planning and a strategic approach. Entrepreneurs must have a clear understanding of their target market, the competitive landscape, and the potential demand for upcycled products. They must also have a solid understanding of the costs associated with upcycling and the potential revenue streams that can be generated through the sale of upcycled products. By carefully considering these factors and developing a comprehensive business plan, entrepreneurs can successfully incorporate upcycling into their business model and reap the rewards of this innovative approach to waste management.

In a nutshell

Entrepreneurship is the creation and operation of a new business venture to achieve a profit or fulfill a social need. It requires creativity, risk-taking, innovation, and resilience, as well as financial management, effective communication and networking, and the ability to pivot one's business model. **Waste management and reduction methods** include the principles of the waste hierarchy, lean production processes, and product design for the environment, and businesses can assess the environmental impact of their waste production through life cycle assessments and waste audits. **Upcycling waste into new products** with greater value can benefit entrepreneurs by reducing costs, increasing competitiveness, and enhancing brand image.

Food for thought

- How can upcycling be incorporated into the business model of a startup?
- What are some creative upcycling strategies that can help entrepreneurs reduce waste and costs while adding value to their products?

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- In what ways can upcycling contribute to a company's branding and social responsibility initiatives?
- How can entrepreneurs use upcycling to differentiate themselves in a competitive market and attract environmentally conscious customers?
- What challenges might entrepreneurs face when implementing upcycling practices in their business, and how can they overcome these challenges?

Extra resources

The Ellen MacArthur Foundation: A global organization focused on accelerating the transition to a circular economy through research, education, and collaboration. Their website includes articles, case studies, and tools on circular design and business models.

Cradle to Cradle Products Innovation Institute: A non-profit organization that provides certification for products that meet high sustainability standards. Their website includes resources for sustainable design, materials, and manufacturing.

The Circular Design Guide: A free online resource developed by the Ellen MacArthur Foundation and IDEO that provides a step-by-step guide to circular design and innovation.

The Sustainable Entrepreneurship MBA: A graduate program at the University of Vermont that focuses on developing sustainable business models and social entrepreneurship.

The Global Reporting Initiative: An international organization that sets standards for sustainability reporting by businesses and organizations. Their website includes guidance on sustainability reporting and tools for measuring and managing sustainability impacts.

Self-assessment

1. Which of the following is a best practice for managing waste production material?

A) Dumping waste in landfills

B) Burning waste in open air

C) Recycling waste whenever possible

D) Ignoring waste altogether

2. What is upcycling?

A) Turning waste into new products of equal or lesser value

B) Turning waste into new products of greater value

C) Dumping waste in landfills

D) Burning waste in open air

3. What is entrepreneurship?

A) The process of creating something new of value by devoting the necessary time and effort, assuming the accompanying financial, psychic, and social risks and receiving the resulting rewards of monetary and personal satisfaction and independence.

B) The process of wasting resources and creating pollution in the environment.

C) The process of ignoring social responsibility for the sake of profit.

D) The process of copying existing ideas and products without adding value.

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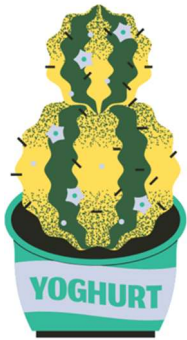
Glossary of terms

Upcycling - the process of transforming waste materials into new products of higher value.

Circular economy - an economic model that aims to minimize waste and maximize the use of resources through practices such as recycling, upcycling, and closed-loop production.

Entrepreneurship - the process of creating and running a new business venture in order to achieve a profit or fulfill a social need.

Financial management - the practice of managing a company's financial resources, including cash flow, profit and loss, and return on investment.

Lean production - a method of production that aims to optimize efficiency and minimize waste.

Design for Environment (DfE) - a design approach that considers the environmental impact of a product throughout its lifecycle, from raw materials to disposal.

Waste hierarchy - a framework for waste management that prioritizes waste reduction, reuse, and recycling.

Life cycle assessment (LCA) - a tool that assesses the environmental impact of a product or process throughout its lifecycle.

Waste audit - a process of analyzing the types and quantities of waste produced by a business to identify areas for waste reduction.

Closed-loop systems - a production process where waste materials are fed back into the production process to reduce waste and increase efficiency.

Market need - a gap or opportunity in the market that can be fulfilled by a product or service.

Networking - the process of building relationships with individuals or organizations in a particular industry or community.

Adaptable - the ability to adjust or change strategies and approaches based on feedback or changing circumstances.

Resilience - the ability to recover quickly from setbacks or failures.
Risk-taking - the willingness to take risks and embrace uncertainty in pursuit of business opportunities.

Innovation - the ability to develop new ideas, products, or processes.
Differentiation - the process of distinguishing oneself from competitors through unique offerings or strategies.

Environmental impact - the effect that a product, service, or process has on the environment.

Upcycling opportunity - a situation where waste materials can be transformed into new products of higher value through upcycling.

Waste reduction strategy - a method or approach used to minimize waste production.

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"**Acid Rain: A Teachers Guide** (PDF 56 pp, 4.6 MB) Lesson plan and activities from EPA for teachers on acid rain. Grades: 6-8. Type of Resource: Lesson plan. Acid Rain Student Pages. Find the acid rain student pages, as well as general information for older students or adults. Grades: K-12."

https://www.epa.gov/students/lesson-plans-teacher-guides-and-online-environmental-resources-educators

"**The Big List of Free Teaching Resources for All Ages and Subjects Loads** of fun and interesting lessons, videos, activities and more. Elizabeth Mulvahill on June 1, 2022 According to the U.S. Department of Education, teachers spend an average of $479 of their own money on classroom supplies."

https://www.weareteachers.com/free-teacher-resources/

"Open Educational Resources for Educators, by Matt Davis (2013) Davis has authored a variety of resource compilations, organized around calendar-based topics and other themes. Take a look at some other Edutopia-curated lists, many of which include open materials, by Davis, VideoAmy, and others: English Language Arts. Elementary ELA Common Core."

https://www.edutopia.org/open-educational-resources-guide

The Ellen MacArthur Foundation: A global organization focused on accelerating the transition to a circular economy through research, education, and collaboration. Their website includes articles, case studies, and tools on circular design and business models.

https://ellenmacarthurfoundation.org/

Cradle to Cradle Products Innovation Institute: A non-profit organization that provides certification for products that meet high sustainability standards. Their website includes resources for sustainable design, materials, and manufacturing.

https://c2ccertified.org/

The Circular Design Guide: A free online resource developed by the Ellen MacArthur Foundation and IDEO that provides a step-by-step guide to circular design and innovation.

https://www.circulardesignguide.com/

The Sustainable Entrepreneurship MBA: A graduate program at the University of Vermont that focuses on developing sustainable business models and social entrepreneurship.

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https://www.uvm.edu/business/simba_sustainable_innovation_mba

The Global Reporting Initiative: An international organization that sets standards for sustainability reporting by businesses and organizations. Their website includes guidance on sustainability reporting and tools for measuring and managing sustainability impacts.

https://www.globalreporting.org/

8. How to assess upcycling

Upcycling is increasingly being recognized as a practical and creative way to reduce waste, and promote environmental sustainability. There are numerous ways to assess upcycling, depending on everyone's interests and available resources.

Strating point of assessing upcycling is through online tutorials and blogs, where a plethora of ideas and inspiration can be found. Websites like YouTube, Pinterest, and Instructables offer step-by-step guidance on how to turn unwanted materials into practical, and often beautiful, items.

Another way to assess upcycling is to connect with professionals and enthusiasts in the field. Searching for upcycling workshops, seminars, and meetups in a community or searching for virtual events online. Art studios, community centers and environmental organizations often offer upcycling workshops, providing an opportunity to learn new skills and make connections with like-minded individuals.

Social media groups dedicated to upcycling also provide an excellent way to connect with others, share ideas, and get tips on where to find materials and resources.

Second-hand shops considered to be also an excellent way to assess upcycling. Physically browsing thrift stores and flea markets offers the chance to find unique items that can be repurposed into something new and valuable. Second-hand stores often sell items for low cost, reducing the need to purchase new materials.

Finally, attending sustainability and eco-friendly events, such as sustainability fairs and eco-design shows, can be a great way to learn about upcycling from experts in the field and interact with other individuals interested in promoting sustainable practices.

Overall, there are numerous ways to assess upcycling, offering a practical and fun way to promote sustainability and creative problem-solving.

Who to assess the effectiveness of the upcycling process ?

- **Identify the objectives:** Identify the objectives of the upcycling process and determine what you want to assess. For example, improving sustainability, reducing waste, increasing creativity, or enhancing efficiency;
- **Specify measuring criteria:** Once the objectives are identified, the criteria needs to be define in order to measure the effectiveness of the upcycling process. The criteria can vary based on the objectives, but some typical criteria include cost savings, reduced waste, resource efficiency, and environmental impact;
- **Note the information:** Gather information that is consistent with the measurement criteria. To assess the quantity of waste produced before and after upcycling, the improvement in resource efficiency, or the

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cost savings, be sure to collect data both before and after the procedure;

- **Study the information:** To ascertain whether the upcycling procedure was successful, analyze the data gathered. To make sense of the data and find potential connections or patterns, use a variety of statistical methods;

- **Receive/ collect feedback:** Seek feedback from stakeholders, including students involved in the upcycling process and customers who use upcycled products. Identify areas for improvement and make necessary recommendations.;

- **Keep improving:** Based on the received information analysis and feedback, continuously improve the upcycling processes, including the design, development, and implementation of the process.

Overall, assessing the effectiveness of upcycling involves identifying the objectives, defining criteria, noting information, analyzing the receiving information and feedback and continuously improving the process.

Learning outcomes

After reading this module:

- The reader will be able to recognize how to access Upcycling
- The reader will understand how to assess Upcycling in the classroom (STEAM)
- The reader will get to know Quantitative Evaluation parameters to assess an upcycling project

- The reader will get to know Qualitative Evaluation parameters to assess an upcycling project

Content

8.1. How to assess upcycling in the classroom (STEAM)

Upcycling is an innovative and creative way of reducing waste and preserving resources, making it a valuable educational tool for the classroom. Assessing upcycling in the classroom can provide valuable insights into its effectiveness in teaching concepts such as sustainability, recycling, and creative problem-solving. By evaluating the outcomes of upcycling activities, educators can identify strengths and weaknesses in their approach, make changes where necessary, and improve the overall learning experience for students.

To assess the effectiveness of upcycling in the classroom (STEM/STEAM), the following steps can be followed:

- Identify the learning objectives: Identify the objectives of the upcycling project in the classroom and determine what you want to assess. This may include enhancing creativity, problem-solving skills, resourcefulness and environmental awareness;
- Define the measurement criteria: Once the objectives are identified, define the criteria to measure the effectiveness of the upcycling project. The criteria can vary based on the objectives, but some typical criteria to assess STEAM principles include the effectiveness of the design,

innovation and development, presentation skills and environmental impact;

- Capture data on project success: Capture data on how successful the upcycling project was in comparison to the objectives defined. Some metrics to capture may include project completion rates, project complexity, innovation, creativity, critical thinking and problem-solving;

- Evaluate the process: Evaluate the upcycling project development process to identify any potential challenges, best practices and areas of improvement. Some aspects that might be looked at may include project planning, pre-design phases, problem-solving skills, and creativity used by the students and teachers;

- Analyze the data: Analyze all data gathered following collection by using various statistical tools to help make sense of the data and identify possible correlations or patterns;

- Evaluate the feedback: Seek feedback from students and teachers who participated in the upcycling project to identify areas of improvement, specific challenges, critique of the project, satisfaction levels, and overall learning experience;

- Continuously improve: Based on the findings from data analysis and feedback, continuously improve the upcycling project development process.

Overall, assessing the effectiveness of upcycling in the classroom (STEM/STEAM) involves identifying the learning objectives, defining criteria, capturing data, evaluating the process, analyzing the data, evaluating feedback, and continuously improving the process. By doing so, you can provide evidence of the effectiveness of the upcycling in improving STEAM skills, promoting

environmental sustainability, and enhancing creativity and problem-solving abilities among students.

8.2 Quantitative Evaluation parameters to access an upcycling project (Creativity, Teamwork, Objective achievement)

Quantitative evaluation parameters can be used to assess the success and effectiveness of an upcycling project in a systematic and objective way. These quantitative parameters measure specific aspects of the upcycling project, such as cost-effectiveness, environmental impact, and quality, and allow for meaningful and comparative analysis between different projects. By using quantitative evaluation parameters, educators and other stakeholders can determine the tangible outcomes of upcycling activities, identify areas for improvement, and make data-driven decisions that enhance the outcome of the project. Examples of quantitative parameters used in assessing upcycling projects include material cost, time and labor cost, quality, environmental impact, cost savings, innovation, and scalability. These parameters provide a framework for educators to measure the efficiency and efficacy of upcycling projects, and help determine the extent to which the project meets specific learning outcomes and sustainability goals. Ultimately, leveraging quantitative evaluation parameters can aid in better understanding the educational value and overall impact of upcycling initiatives in the classroom and beyond.

To evaluate an upcycling project, you can use the following quantitative evaluation parameters:

- Quantity of waste diverted: Measure the total amount of waste diverted, including the type and volume of waste before and after upcycling.

- Resource efficiency: Establish how efficiently the resources were used in the upcycling process, including materials, energy, and labor. This could involve considering the costs incurred during the upcycling process compared to purchasing new materials.

- Environmental impact: Determine the project's impact on the environment, such as reducing carbon emissions, conserving resources, and preventing waste pollution.

- Cost-effectiveness: Evaluate the cost-effectiveness of the upcycling project. This could involve comparing the cost of raw materials before and after upcycling, the cost of manufacturing the upcycled products, and the return on investment from the upcycling project.

- Product quality and durability: Evaluate the quality, durability, and performance of the final upcycled products. This involves examining the longevity of students learning experiences and their impact compared to traditional educational methods.

- Team performance: Evaluate the performance of the team involved in the upcycling project. This involves analyzing the team's productivity, efficiency, and contributions towards the project.

8.3 Qualitative Evaluation parameters to access an upcycling project

Qualitative evaluation parameters can be equally important as quantitative when assessing the success and effectiveness of an upcycling project. Qualitative parameters provide valuable insight into aspects of the upcycling

project that are difficult to quantify, such as creativity, innovation, and personal growth. They provide educators and other stakeholders with a deeper, broader understanding of the impact and outcomes of the project.

To evaluate an upcycling project, you can use the following qualitative parameters based on formal and informal feedback, with a focus on how to motivate students:

- Student engagement: Evaluate the level of engagement of the students involved in the upcycling project. This can be done by observing their interest level, excitement, and enthusiasm during the project. You can also use student self-assessment survey techniques to gather feedback on their own level of interest and engagement;
- Creativity: Assess how creative the students were in developing upcycling ideas. This includes identifying the unique aspects of each upcycling project and evaluating how creative the students were in developing their own ideas;
- Critical thinking and problem-solving skills: Evaluate the extent to which the upcycling project prompted students to use critical thinking and problem-solving skills. This could involve analyzing how well the students tackled challenges or overcame obstacles throughout the upcycling project;
- Self-motivation: Assess the level of self-motivation the students demonstrated during the upcycling project. This includes evaluating how well they were able to work without direct supervision and how willing they were to take initiative and explore new ideas;
- Teamwork and collaboration: Evaluate the level of teamwork and collaboration among the students involved in the upcycling project.

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This includes analyzing how well the students worked together, divided tasks, and completed the project as a team;

- Informal feedback: Gather informal feedback about the students' experiences in the upcycling project. This could involve conducting focus groups or individual interviews to understand the students' thoughts about the upcycling project and how it could be improved.

By using a combination of formal and informal feedback, it is possible to motivate students by providing them with opportunities to engage in creative problem-solving activities, integrate their understanding of STEAM principles in real-world application, and foster a stronger sense of team spirit.

In a nutshell

This module introduced to the reader the ways of accessing Upcycling in general and in the classroom including the most important qualitative and quantitative evaluation parameters for evaluating an Upcycling project. It can be concluded that Upcycling is increasingly being recognized as a practical and creative way to reduce waste, and promote environmental sustainability.

Food for thought

- What Upcycling can offer as a teaching educational method?
- How does upcycling align with my teaching philosophy and values?
- How can I weave upcycling seamlessly into my current curriculum?

Self assessment

1. **Why is upcycling important in the classroom ?**

    a) It helps to reduce waste and promote sustainability

    b) It provides opportunities for students to express their creativity

    c) It helps to improve academic performance

    d) None of the above

2. **How can teachers assess the effectiveness of upcycling activities in the classroom?**

    a) By evaluating student engagement and participation

    b) By measuring the amount of waste produced by the class

    c) By testing students on upcycling techniques

    d) By comparing upcycling projects to traditional recycling

3. **Which of the following is a quantitative evaluation parameter for an upcycling project?**

    a) The number of students who participated in the project

    b) The amount of waste materials used in the project

    c) The level of artistic skill displayed in the final product

    d) The number of social media likes received for the project

4. **Which of the following is a qualitative evaluation parameter for an upcycling project?**

a) The level of creativity and originality displayed in the project

b) The weight of the final product

c) The amount of money spent on materials

d) The number of hours spent working on the project

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Key to the Self-Assessment

MODULE 1.

1B, 2A, 3E

MODULE 2.

1B, 2C, 3D

MODULE 3.

1D, 2 FALSE, 3C, 4D

MODULE 4.

1B, 2B&C, 3A

MODULE 5.

1A, 2A, 3D

MODULE 6.

1A, 2A, 3A, 4A

MODULE 7.

1C, 2B, 3A

MODULE 8.

1A, 2A, 3B, 4A

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