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Educational Materials

Circular Organic Management

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Table of Contents

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Introduction

The existing instructional materials have been carefully developed with the primary goal of giving educators across Europe, complete resources and advanced techniques specifically designed for the spread of environmental education.

These resources' content is designed to be easily incorporated into extracurricular activities as well as conventional educational environments. It includes a variety of interesting exercises meant to hold students' interest while simultaneously establishing a strong feeling of accountability for environmental care.

Most notably, there is a clear emphasis on experiential learning in the materials, which guarantees that teachers may infuse classroom sessions with concrete, real-world applications. Through the development of awareness, critical thinking, and a concrete connection to the natural world, these resources enable educators to raise a generation that is not just ecologically conscious.

ICEBREAKERS / WARM UP EXERCISES

The purposes of the following ideas for 'warm up' activities / exercises are to:

- Familiarize students and teachers with the general overall topic content of the upcoming lesson,
-Introduce the overall theme of ecological habits / behavior
-Help both students and teachers start to use, and get comfortable with, participative, critical-thinking, student-centered learning
-Create a learning environment that encourages open expression, non-judgemental discussion and non-directional guidance
-Allow students and teachers to learn more about each other's ideas, thoughts, opinions and knowledge about ecological issues and habits in a fun, semi-structured manner

The exercises will support teachers who may not be used to working with interactive pedagogical methodologies to start to utilize 'teacher as facilitator' approaches to interacting with their students, and give them initial insights into how their students might respond to these methods.

The activities are not designed to be prescriptive or to be used with specific chapters of the content. They can and should be adapted to suit each class (age, culture, levels of experience with interactive learning styles etc), so that each session on issues of organic waste management has a fun, creative and inspiring start through which the children and the teacher find out a bit about each other, share ideas openly and inspire each others' interest in learning together.

Tips and ideas for creating a critical-thinking, student-centered and participative learning environment:

ASK instead of tell – elicit thoughts, expression, ideas that students have and can share, to contribute to the production of knowledge and ideas collectively, so they create and own the learning process and outcomes, and feel connected to the issues.

Ask HOW students feel about something, rather than WHAT they know about something
E.g. Ask students "How do you feel about trash in your neighbourhood" rather than "What do you know about the volume of waste produced in your city each year".

This firstly, creates a local context for the wider global issues and thus connects with students' experiences.

Secondly, it allows students to express their opinions and share their daily observations and feelings without being expected to have a 'correct' answer or worrying about being 'wrong'. This contributes to the creation of a supportive, open and non-judgmental learning environment.

Thirdly, it allows the teacher to embark on a discussion without feeling stressed that they might be confronted either by silence (if the students either do not know the 'correct' answer or are disinterested) or with answers that they may not know how to respond to, are different from what they expected, or will not know if they are 'correct' or not.

By asking about and discussing experiences, rather than asking for or giving facts, both students and teachers can start to share ideas and feel comfortable in contributing to a collective body of knowledge and cooperation, within a non-judgmental framework.

Start from the personal and practical; then move to the large scale and abstract/theoretical

In order to generate and sustain engagement with the issues to encourage action and behavior change, it is vital that students feel some kind of connection to the topics. Therefore, starting from their personal experiences and local issues -using actual examples of a specific neighborhood space or natural area- is central to creating this connection. Starting from a personal (household) level, through the local level and then to city, country and global, students will thus be able to link issues (rather than needing to be 'told' them) and will therefore not only approach the theory with a better grasp, but will also feel more inspired and responsible with regard to making changes at a local level.

If a teacher builds from students' personal experience to collectively uncover a principle or idea which can be applied to a wider scale, the students should then be able to contribute to articulating the theory, with the teacher eliciting ideas and guiding them, rather than having to 'deliver' the theoretical input. This will allow students to build critical thinking skills and enjoy a feeling of accomplishment, as they will have worked together to understand the theory, rather than having it 'told' to them. When global statistics or issues are discussed, it is essential to connect these (and encourage students to make the connections) to local issues and the neighborhood scale.

WARM UP ACTIVITIES

1. How I feel today

Aim

To create a space and time of sharing of the mood and feelings with which we enter into the learning process. This can help the learners to engage deeper and better in the learning process and it can also help the educator/facilitator to have a better understanding of the personal and group dynamics and potentially adjust the learning activities to correspond to different needs.

Materials

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Method:

We sit in a circle and we invite all the participants (students/kids and adults/educators) to take some time to share how their last day has been, how they feel in the present moment and with what expectations (and maybe second thoughts) they have come to the circle.

To enrich the communication and go beyond the only-verbal dimension we can additionally suggest that whoever wants, can combine the verbal sharing with making a grimace or taking a position in space (like a frozen image) that represents their feelings in the present moment.

Depending on the time we have to complete the activity, we can give a relevant time frame for each person to express themselves. This could vary from 10 seconds and a short sharing, up to 2-3 minutes for a session lasting one teaching hour, or even longer if this activity comes at the beginning of a multi-day project.

Last but not least, it is important that the adults of the group also share how they feel so that the kids feel more connected. However, it is important that the sharing is not obligatory either for the adults or for the kids. If some people don't want to share, this is absolutely acceptable and respected and they can remain silent and just listen to the others.

2.The sculptor and the sculpture

Aim

To create a space and time of sharing of the mood and feelings with which we enter into the learning process. This can help the learners to engage deeper and better in the learning process and it can also help the educator/facilitator to have a better understanding of the personal and group dynamics and potentially adjust the learning activities to correspond to different needs.

Materials

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Method

We invite the participants to stand up and form a circle where everyone can see the others. We then invite the participants to start walking in the circle in random directions trying to fill the gaps created while the other people walk. We invite the participants to walk in different styles and under various conditions, walk fast (but not running so as to avoid the possibility that someone is hurt), walk very slow, walk as if we were walking without shoes on hot sand, walk as if we were walking on ice, walk by jumping like kangaroos, walk like chicken and maybe imitate the voice of chicken, walk like cats and imitate the voice of cat etc...

While we continue walking, we form groups of two or three in the following way. We invite the participants to walk as if an intense rain has started. It's a storm and everyone wants to avoid getting wet. We can raise our hand above our head as a small roof tile however this is not enough to protect us from the rain. To have a proper roof we need to find one or two more people, touch the tips of our hands above our heads and create together a big enough roof with our roof tiles. We invite the participants to find people they feel comfortable with but also if they can feel comfortable with a person that they do not already know well, to prefer to meet that person rather than a friend so that they have an opportunity to make new friends additionally to their existing ones.

When we have the groups of two or three people created, we invite each person to imagine that they are a sculptor and that the other person/people of the group is made of playdough. The sculptor is invited to create a sculpture with the body of the other person/people of the small group which will be presented to the plenum later on. The sculpture can represent the creator's current feelings or a message that the sculptor would like to share with the whole group. When the sculptor has completed the sculpture, they memorize it to be able to recreate it later in front of the plenum and they switch roles with the person/people of the small group.

Before the sculpture activity begins, we ask all the participants if they are ok with touch by the other person/people of the small group. We explain that it is absolutely acceptable and respected if they wouldn't feel comfortable with this activity and that there is also an alternative. We give all the space and time for the participants to express any second thoughts. If such second thoughts are expressed, the alternative way is that in the small groups of these people there will be no touch and the sculptor will give verbal guidance/directions until the sculpture is formed.

Moreover if some groups are not comfortable with the sculpture concept at all. They are invited to just discuss with each other how they feel in the present moment and what message/feelings they would like to share in the plenum. They are advised to listen carefully to the other person/people of the small group because in the plenum they will not present themselves but another person of the small group.

When everyone has passed from the role of the sculpture and the sculptor we return to the plenum. The sculptors present their sculptures and share their feelings and messages with the whole group. Also, the people that discussed with each other instead of creating sculptures, present to the plenum the person/people they discussed with. If there is enough time, then in each presentation the big group is given some time to reflect on the creation presented.

The activity closes with a quick circle where the participants are invited to say 2 words or a short phrase on how they felt about this activity. They are also invited to share any difficulty they might have had carrying out the activity so as not to leave the activity without having shared it.

Last but not least, it is important that the adults of the group also participate in the activity so that the kids feel more connected. An important detail is that in small groups created it would be advisable for the adults to form small groups with adults, and the kids with kids so that the kids can express themselves more freely. Also, an essential element is that the participation is not obligatory either for the adults or for the kids. If some people don't want to participate in some phase of the activity or even in the whole activity, this is absolutely acceptable and respected and they can stay out and just observe to the others, provided that they will remain quiet and they will not bother the others.

3.Monster madness:

Aim:

To introduce students to collective ways of working in a fun, amusing manner and to highlight the difference between working together and working cooperatively.

Materials:

1 sheet of A4 (scrap paper) per student
1 pen / pencil per student

Method:

- Divide students into groups of 4 and give each a piece of paper and a pen
- Explain that they are going to draw monsters together, but without sharing any ideas.
- Explain that on their paper, they will draw a monster's head at the top and then fold it over, with only two lines of its neck showing.
- They will then pass this on to the person to their right in the group, who will draw the torso and arms.
- This person will then fold over the paper with only two lines of the waist showing and pass it on, to their right.
- The 4 pieces of paper will go around the circle of the groups of 4 until each piece of paper has a head, torso and arms, legs, and feet. (each student will only see the section of the monster that they are drawing at any time and each student will draw 1 head, 1 torso and arms, 1 set of legs, 1 set of feet, but each on a different piece of paper)
- After each student has finished drawing the feet, the groups open up the 4 pieces of paper and look at their collective 'monsters'.
- Allow time for laughter, sharing with other groups etc and ask questions such as "What names shall we give our monsters?" or "What inspired you to draw 3 eyes?" or "Which monster looks the scariest /funniest?" etc (that is, questions that encourage more expression, discussion and sharing of ideas, without asking for 'right/wrong' answers).

- Place the monsters to the side / put them on the walls.
- Ask students something along the lines of “Did we draw the monsters together or separately?” and try to elicit the understanding that although they worked together on the monsters, they didn’t ‘cooperate’ and that’s why the results were funny and not logical.

Highlight that working cooperatively can create much more logical outcomes (try to avoid the use of the word ‘better’) and solutions than working separately, so it is good to share ideas rather than each person to work on their own – e.g. “These monsters are what we created by working together on the same project, but WITHOUT sharing our ideas. Let’s see what wonderful things we can discover and create when we both share our ideas AND work together!”

ACTIVITIES INTRODUCTORY TO THE TOPIC IN A CREATIVE WAY

Expressing feelings and ideas about a theme, in a structured framework: poetry.

Aim:

- to help students feel comfortable expressing feelings and knowledge about environmental issues, in a manner that is structured in terms of its format.
-to start the process of distinguishing fact from opinion in written text – developing critical-thinking skills which will be applied to the content of the chapters.

This format of asking students to write a poem around a topic provides a 'safety net' or framework for expression, while allowing for ideas to be shared and is very helpful for students and teachers who may not be used to expressing opinions or personal thoughts in class. If a teacher were to simply say "What are your thoughts about trash?" students who have not had much experience of interactive classes or have been used to learning by rote, may struggle to formulate a response. The 'short poem' approach provides a very precise format, within which opinions can be stated more easily than a completely non-guided approach, but still without the teacher intervening or directing the opinions.

Method:

- Tell students that they are going to write a short poem in a specific format... in 5 minutes!
- Write the theme on the board (e.g. 'trash')
- Write out the format of the poem

Here are 3 suggestions for the poem format: Use and adapt whichever best suits your language, culture, students' ages etc.
a) the 5 line poem,
b) the 'lantern' poem and
c) the haiku.

- **5 line poem**

Format:

Title
3 adjectives
3 verbs in the -ing / gerund form
3 final words
Title

Example:
trash
dirty, ugly, bad
polluting, smelling, damaging
we must improve
trash

- **'Lantern' Poem**:

Format:

Title:
1st line – 1 syllable
2nd line – 2 syllables (can be one word or two words)
3rd line – 3 syllables
4th line – 4 syllables
5th line 1 syllable
6th line – 1 syllable

Example:

Trash
Waste
Dirty
We need more
Mentality
Change
Now

- **Haiku**

Format:
1st line – 5 syllables
2nd line – 7 syllables
3rd line – 5 syllables

Example:
Trash is a bad thing
It makes our cities dirty
We should change our ways

- Give them 5 minutes to write their poem
- Ask them to share their poems in groups
- Ask each group to identify common words and themes and discuss why they used them, why these issues are important etc
- Ask each group to identify a) words that are factual (e.g. 'polluting') and b) words that are an opinion or describe a value (e.g. 'must, should, bad, annoying' etc) and ask them to consider how to apply this skill to texts that they will read
- Share thoughts with the class (if appropriate)
- Don't focus on the literary quality or grammatical accuracy of the poems at all. Guide students to share thoughts about the words they chose and why.
- Keep the poems and at the end of the class (or the end of the series of classes), re-look at the poems in groups or as a class and reflect on how ideas have developed or opinions have changed

Brainstorming:

Aim: to discover what students know, feel and experience about a topic, through free expression, cooperation and discussion.

The activity allows the teacher to understand the levels of knowledge and depth of feeling about the issue, prior to starting the lesson on that topic, and encourages sharing of ideas around one issue, without specific directional instructions or teacher-led input. At the end of the lesson on the topic, the initial brainstorm ideas can be revisited and reflected on.

Materials:

- Large sheets of paper
- Selection of pens / markers

Method:

- Divide the class into groups of 4 or 5
- Give each group a sheet of paper and markers
- Write the topic on the board (ensure that this is a broad topic and only 1 or 2 words e.g. 'organic waste')
- Ask each group to write the topic in the center of their sheets of paper and tell them that for 5 minutes, they will all write whatever words and ideas they think of, connected with the topic, on the paper
- After 5 minutes, ask the students to stop writing
- Give them 5 more minutes to look at their own (their group's) work and draw lines or symbols to connect / highlight any of the issues that have been written down
- Ask each group to take a look at the other groups' work and a) identify common words / themes and b) highlight words or phrases that are unknown or unexpected.
- As a class, ask the students what words and phrases appeared in many of the brainstorms, what these mean to them and why they chose them.
- Ask people to talk more about some of the issues, ask the people who wrote down unexpected or unknown words to explain them.
- Ask questions such as "How did you feel about X / how did you feel while doing the brainstorm?" All responses are valid without the teacher having to say "right / wrong".

Draw out some of the themes that are relevant to the upcoming class and write them on the side of the board. Tell the students that after that day's class / activity, the brainstorms will be revisited to reflect on what has been learned and see if opinions have developed or changed.

Trash talking:

Aim: to get a flow of ideas started about environmental issues in general, in a fun and interactive way, without any directional intervention from the teacher.

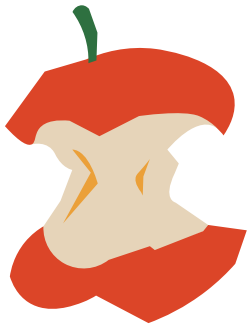
Materials:

1 sheet of scrap paper 'squashed up' to form a 'ball'

Method:

- Arrange the students to sit in a circle
- Explain to them that the theme is 'trash' (or 'organic waste' or 'environment', or whatever you determine is a useful and broad topic)
- One person will hold the 'ball' and say a word connected to the topic
- They will then throw the 'ball' to anyone else in the circle who will catch it and as they hold it, they need to say a word (connected widely with the theme) starting with the last letter of the word that the first person has said.
- The person who says the new word, then throws the 'ball' to another person in the circle who has to say a word starting with the last letter of the one the previous person (the ball-thrower) has said. The words can be nouns, adjectives, verbs, opinions, facts etc and can be very widely linked to the theme.

e.g. – the teacher gives the broad theme of 'ecology'
Person 1 – "Trash"
Person 2 – "Horrible"
Person 3 – "Environment"
Person 4 – "Trees"
Person 5 - "Sustainability"
Etc.



The word doesn't have to be linked directly to the one before it (apart from with regard to the letter of the alphabet) but should have something to do with the broad theme.

- Adapt this as necessary to suit the age of your class and the specifics of your language.

TITLE: "1.The life cycle of bio-waste. From production to collection through appropriate prevention and utilisation."

AGE FRAME: 14-18
HOURS: 8 hours (held with 3 months)

Information

The life cycle of organic waste is a cornerstone of sustainable waste management, crucial in preserving our environment. It begins with the generation of diverse organic materials—food scraps, yard trimmings, and various biological residues sourced from agriculture and industry. Effective bio waste collection systems play a pivotal role in diverting this waste away from landfills.

Strategies aimed at reducing food waste through awareness campaigns and improved storage practises further aid in preventing its excessive generation. Following collection, the recovery phase involves transformative processes like composting or biomethanation, turning organic waste into invaluable resources such as compost and biogas.

These end products serve dual purposes: enhancing soil quality and promoting crop growth in agriculture while offering a sustainable source of renewable energy. Recognizing the impact of organic waste on the environment underscores the importance of proper management practices, not only to minimise environmental harm but also to harness its potential in advancing circular and eco-friendly waste management approaches.

Educational objectives:

- To develop a thorough understanding of the complete life cycle of organic waste
- To gain the ability to assess the environmental implications of organic waste management practices, evaluating their sustainability, and recognizing the role of organic waste in reducing greenhouse gas emissions and soil degradation.
- To explore and analyse various strategies for the prevention of organic waste generation.
- To acquire the skills to effectively manage organic waste resources by studying the conversion processes of composting and the production of bioenergy, including biomethanisation and pelletisation.

Learning outcomes:

- Students will be able to develop a waste management plan, using a managerial and forward-looking approach;
- Students will be able to explore local and national data, with a critical and analytical lens;
- Students will be able to implement marketing and communication skills for the development of awareness-raising campaigns.

Activity 1: "Designing a Sustainable Waste Management Plan"

Purpose of the activity: Organic waste follows a cyclical journey from its creation to its eventual disposal or reutilization. Initially, it emerges from various sources including households, agricultural activities, and industries, encompassing biodegradable materials like food scraps, yard trimmings, and plant-based or animal-derived matter. Efficient collection systems are pivotal to redirect this waste from landfills, allowing for proper management and treatment. Strategies focusing on waste prevention seek to minimise its generation through improved consumer habits, better storage practices, and educational campaigns. Once collected, organic waste undergoes recovery processes like composting or biomethanation. Composting breaks down organic matter into nutrient-rich compost, beneficial for soil enrichment, while biomethanation produces biogas, a renewable energy source. These resulting products find utilisation in agriculture, landscaping, or as an alternative energy source, contributing to a more sustainable waste management approach. However, mismanaged organic waste in landfills contributes to methane production, emphasising the importance of proper waste management to mitigate environmental impact.
This activity aims to challenge students to apply their knowledge of the life cycle of organic waste by designing a comprehensive and sustainable waste management plan for a hypothetical community. Through this exercise, students will integrate concepts of waste generation, collection, prevention, and utilisation to develop a practical solution.

Duration of the activity: 8 hours

Description of the activity:

1. **Scenario Introduction**: Provide students with a detailed scenario of a fictional community facing organic waste management challenges. Include information on the community's size, demographics, landscape, waste generation rates, current waste practices, and environmental concerns.

2. **Data Collection:** In teams (or individually if this is deemed more appropriate), students should gather data and conduct research relevant to the scenario. This might include waste generation statistics of communities with similar characteristics,, any relevant regulations, existing organic waste management practices in their community or other communities, understanding the environmental concerns and translating these to impact.
3. **Waste Audit:** A waste audit is a systematic assessment and analysis of the types and quantities of waste generated by an organisation, community, or specific area. It involves examining and categorising different types of waste materials to understand their composition and volume. Waste audits provide valuable information that helps organisations or communities make informed decisions about how to effectively manage their waste, reduce environmental impact, and optimise resource use. Encourage students to conduct a hypothetical waste audit for the community, determining the types and quantities of organic waste generated. In order to go about doing this, they should start by finding statistics on the composition of organic waste in their own community, Municipality or country (whatever makes more sense), and apply these percentages to the amounts generated in their hypothetical community. This way they will be able to infer the sources (households, businesses, municipal spaces, etc) of the waste and develop their plan accordingly.
4. **Plan Development:** Based on the collected data and their understanding of proper organic waste management principles, students should design a comprehensive waste management plan for their hypothetical community. The plan should address waste prevention, efficient collection methods, recycling, composting, bioenergy production, and the appropriate utilisation of resulting products based on the geography and landscape of the community. The plan should include:

- **Waste Assessment:** Analyse waste generation patterns and current practices.
- **Prevention Strategies**: Educate on reducing, reusing, and sustainable consumption.
- **Collection System:** Design efficient waste collection routes and methods.
- **Recycling Program:** Establish recycling facilities and educate on sorting practices.
- **Organic Waste Management:** Implement composting and bioenergy production.

- **Product Utilisation:** Apply compost in agriculture; use biogas for energy.
- **Adaptation to Local Conditions:** Tailor plans to fit geography and landscape.
- **Community Engagement:** Involve and educate community members.
- **Monitoring Progress:** Set metrics, evaluate, and adjust strategies as needed.

5.**Presentation:** Each group or student should present their waste management plan to the class, explaining the rationale behind their choices, the expected benefits, and potential challenges. Encourage critical thinking and discussion during these presentations.

Activity 2: "Waste Prevention Campaign Design"

Purpose of the activity: This activity encourages students to proactively address the issue of organic waste by designing and implementing a waste prevention campaign. It emphasises the importance of reducing the generation of waste and raises awareness about sustainable consumption habits.

Duration of the activity: 1 week

Description of the activity:

1. **Introduction to Waste Prevention:** Waste prevention stands as a linchpin in curbing the generation of organic waste, wielding significant importance in sustainable waste management strategies. By addressing the root causes of waste generation, such as excess consumption, inefficient production, and inadequate resource utilisation, prevention serves as a proactive approach. It emphasises the reduction of avoidable waste at its source, advocating for mindful consumption patterns, improved product design, and innovative packaging strategies. This approach not only minimises the volume of organic waste but also mitigates associated environmental impacts, conserves valuable resources, and lessens the burden on waste management systems. Waste prevention, therefore, emerges as a pivotal element in fostering a more sustainable and circular approach to handling organic waste, offering long-term benefits for both the environment and society.Begin by discussing the significance of waste prevention and its role in reducing the generation of organic waste. Highlight the environmental and economic benefits of organic waste prevention.
2. **Case Studies:** Provide students with case studies of successful waste prevention campaigns from various communities or organisations. Some examples might be from WWF campaigns, for example:

#NoPlasticInNature: WWF has been actively campaigning against plastic pollution, advocating for reducing single-use plastics and promoting responsible waste management. Their efforts aim to prevent plastic from entering natural ecosystems, especially marine environments, where it poses a significant threat to wildlife.

#Earth Hour: This is one of WWF's most well-known campaigns, encouraging individuals, communities, and businesses to turn off non-essential lights for one hour as a symbolic gesture of their commitment to the planet. It's a global movement advocating for sustainability and energy conservation.

#Palm Oil Initiatives: WWF works extensively on sustainable palm oil production, collaborating with companies and governments to promote responsible sourcing practices. They advocate for reducing deforestation and the negative environmental impacts associated with palm oil cultivation.

#Food Waste Reduction: WWF addresses food waste through campaigns aimed at raising awareness about the environmental impact of wasted food. They work with individuals, communities, and businesses to promote better consumption habits and reduce food waste along the entire supply chain.

#Circular Economy Advocacy: WWF emphasises the transition to a circular economy model, advocating for reducing waste, reusing materials, and recycling resources. They work with governments and businesses to promote policies and practices that support a more sustainable use of resources. Analyse these examples together as a class, discussing their strategies, target audiences, and outcomes.

3. Group Formation: Divide students into small groups and assign each group a specific target audience (e.g., households, schools, restaurants, or businesses) for their waste prevention campaign.

4.Campaign Planning: In their groups, students should brainstorm and develop a waste prevention campaign plan tailored to their assigned target audience. The plan should include campaign goals, strategies (e.g., educational workshops, social media, local events), messaging, and a timeline of implementation.

5.Implementation: Allow students time to implement a part of their campaign plan. This could involve - depending on the age of the students - creating educational materials for the workshops, creating posters for their events, organising events, or running social media awareness campaigns. Encourage them to be creative in conveying their message.

6.Campaign Evaluation: After the implementation phase, have students assess the effectiveness of their campaign. Did it raise awareness? Did it lead to measurable organic waste prevention? Discuss the challenges and successes they encountered during their campaigns.

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Evaluation

Evaluation Method: Assessment Through Participation and Reflection
In this approach, students' evaluation will focus on their active engagement with the module and their ability to reflect on their learning journey. The evaluation criteria will include:
Participation: Assess students based on their participation in discussions, group activities, and class exercises related to organic waste management. Encourage students to share their thoughts, ask questions, and contribute to group work.
Reflection: Ask students to maintain a journal or a reflective portfolio throughout the module. In this journal, they can document their understanding, insights, and personal reflections on each topic or activity. Consider these reflections as part of their evaluation.
Completion of Tasks: Assess whether students have actively participated in module activities, including the information search, core topic activities, and closing activities. Completion of these tasks can be a criterion for evaluation.
Engagement: Evaluate students' willingness to learn from peers, and their ability to integrate new knowledge into their understanding of organic waste management.

This approach provides a more lenient evaluation method that emphasises students' active involvement and self-reflection rather than rigid criteria. It acknowledges that students may have varying learning paces and focuses on their overall engagement with the module.

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TITLE: 2. Household organic waste production and management

AGE FRAME: 12 - 18

HOURS: 1 week at home + 3-6 hours in class before and after the activities (depending on age of students and the option chosen for activity 1)

Information

General ideas or information about the topic

Household organic waste includes food scraps, raw or cooked, and garden waste such as leaves and prunings. More specifically, household organic waste comes from or consists of a biological matter and is produced at home. So, in addition to food scraps and garden trimmings, it also includes paper waste and human and animal waste such as hair and nails.

Household waste belongs to the category of Municipal Solid Waste. Urban centres are a large source of organic waste which in turn make up a large percentage of the bio-waste that ends up in landfills. Apart from households, other organic urban solid waste comes from restaurants, cafes and bars, from hotels, from schools and municipal buildings, from offices and the workplace, from municipal parks, etc.

The problem

Of the 527 kilos of municipal waste that every citizen in the EU produces every year, more than 40% is organic. That is, a student who weighs about 50 kg will create 10 times his/her weight in waste in a year, of which about 4 times will be organic residues.

This means that a huge amount of food waste ends up in landfills, having serious effects on society, the economy, the environment and consequently the quality of our lives.

It is clear by now that food is not distributed fairly among people and that due to poor social organisation and the over-consumption pattern that characterises modern Western societies, it ends up being thrown away, wasting with it the resources and energy used for its production. There is a common misconception that household organic waste ending up in landfill is innocent because it will decompose. However, this is far from true. On the contrary, greenhouse gases are released (including methane - a very potent GHG), which cause air, water and soil pollution, degrading the quality of our health and that of all living organisms. Unfortunately, our society has not realised the "treasure" that is hidden in its waste, allowing kitchen waste to end up mixed with the rest of the materials, making it impossible to utilise.

Utilisation of household organic waste

The most natural way to recycle household organic waste is to compost it - by throwing only organic waste, and not other rubbish, into a compost bin or even directly into the soil (in a specified place), nature takes over to do the decomposition. Under specific conditions and with the help of microorganisms, compost can be produced, i.e. a soil improver (natural fertiliser) of high quality in nutrients, which looks very similar to soil. This process can also be done at home, on the balcony or in the garden, with the use of home composters.

Moreover, several municipalities across Europe have in place systems of separate collection of organic waste, however this is not the norm. Fruits and vegetables (including their peel), eggshells, seeds, cereals, rice, flour, paper bags, coffee grounds and filters, tea bags, dairy, meat and animal products, nuts and their casings, twigs, leaves, soil, lawn, sawdust, shavings and firewood ash are some of the organic materials that can be disposed of in these bins.

Some of the household organic waste can be utilised separately if the infrastructure allows for this, such as frying oils for the production of biofuel or coffee residue, with its high calorific value, for the production of bioenergy.
Note that in some areas, municipal waste water is used for the production of biogas, after processing the resulting sludge.

Resources for more in-depth information.
With a quick internet search, you may find the estimates for the organic waste production in your municipality as well as the methods and percentages of utilisation and/or disposal (landfilling).

EUROSTAT provides a good overview of the municipal waste statistics and management for all Member States, available here: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Municipal_waste_statistics#Municipal_waste_generation

Educational objective and learning outcome

Educational objectives:

- **Awareness:** Increase students' understanding of the importance of managing organic waste in households and its impact on the environment.
- **Knowledge:** Provide students with knowledge about the types of organic waste generated in households, such as the different types of food scraps and food waste that can be utilised
- **Separation:** Teach students how to properly separate organic waste from other types of waste, emphasising the benefits of composting and recycling.
- **Community Engagement:** Encourage students to actively participate in community initiatives related to organic waste management, such as community composting programs or local recycling efforts.
- **Behaviour Change:** Promote behaviour change by encouraging students to adopt sustainable practices in their daily lives and become advocates for organic waste management within their families and communities.
- **Active citizenship:** Encourage students to reflect as active citizens on the utilisation of waste and realise that their actions can make a big difference in reducing their environmental footprint.

These objectives aim to empower students with the knowledge and skills necessary to make informed decisions and take responsible actions towards managing household organic waste effectively.

Learning outcomes:

Knowledge and understanding:

- Students will recognize/infer the environmental impact of food waste in the home, classroom and community context.
- Students will identify different types of organic household waste such as the different types of food scraps and food waste that can be utilised
- Students will understand the importance of separating organic waste from other types of waste for proper management.

Skills development:

- Students will develop skills of responsibility, sensitivity, cooperation and techniques through research and experimentation.
- Students will properly sort and separate organic waste from other types of waste.

Attitude and behaviour change:

- Students will develop a positive attitude towards the reduction, reuse and recycling of organic waste.
- Students will adopt sustainable practices, such as separation at source or even composting, to minimise waste sent to landfills.
- Students will encourage their family members to participate in organic waste management practices at home through awareness raising within the household.
- Students will reflect as active citizens on the utilisation of organic waste, realising that action begins at home.

These learning outcomes aim to equip individuals with the knowledge, skills, and attitudes necessary to effectively manage household organic waste and contribute to a more sustainable environment.

Activity 1

For this activity, there are two options that can be followed - the decision is at the educator's discretion, depending on the students' age and capacities:
Option 1: The whole activity is shared (printed or otherwise) with the students so that they all have the information and the calculations they need in order to fill out their Factsheets on their own.
Option 2: Only the Factsheet is given to the students, who complete Tables 1 and 2 by themselves, while Tables 3-6 are filled out in class with the help of the educator. The necessary calculations can be copied on the board and be performed by the students on their own with the help of the educator as they see fit.

Activity 1: Awareness exercise regarding food waste and its negative effects on the environment

Purpose of the activity:

The purpose of the exercise is to raise the students' awareness on the significant impact food waste generated at home has on the environment, by allowing them to translate this impact into actual numbers. By increasing awareness, the exercise aims to promote responsible behaviour and encourage the proper management of food waste and reduce its associated environmental consequences. This exercise includes providing information about the environmental implications of food waste, highlighting the importance of its utilisation, specifically composting. Ultimately, the goal is to foster a sense of responsibility and inspire individuals to make informed choices that contribute to more sustainable and ecologically sound food systems.

Duration of the activity: 1-2 hours in class + 1 week at home + 1-2 hours in class (depending on age of students and the option chosen)

This time frame allows for an introduction to the topic, presentation of relevant information, interactive discussions, and preparation for practical aspects to take place at home. After the week of measuring at home, time will be given to the students to present their findings, and to critically discuss their personal impact on the environment. More or less time might be needed depending on the age of the students and the option chosen.

Description of the activity:

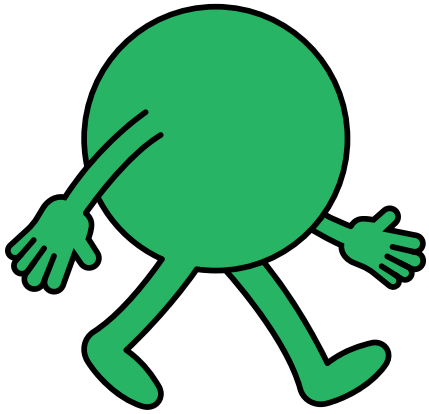
Introduction

Every year, about 1/3 of the food produced ends up in the trash. In addition to the social and humanitarian impact, this waste also has an environmental impact. When we throw away food, the energy and water it takes to grow, harvest, transport and process the food to reach our supermarkets from all corners of the world is also wasted. And if this food ends up in the landfill, it creates methane (CH4) pollution, a greenhouse gas even more powerful than carbon dioxide (CO2).

With this exercise you are invited to measure the food waste that occurs in your home, classroom and community and to calculate the emissions that will be caused by it in two scenarios: a) in the event that the waste ends up in the landfill and b) in the case of composting it.

The measurements you will make will be calculated in the CO2e (carbon dioxide equivalent) unit. CO2e is a standard unit of measurement used for carbon footprinting. The idea is to express the effect of each different greenhouse gas in the corresponding amount of carbon dioxide that would create the same amount of global warming.

Follow the steps below to complete your own FactSheet and see for yourself the environmental impact of (your) food waste. [In the event that not all students have food scales at home, they can be divided into small groups so that each group has access to at least one weighing scale.]



General Data and Measurements

1. Ask the appropriate person at home (usually the one(s) who cook(s)) to separate the organic waste from the rest of the household waste, in a different bin in the kitchen.
2. At the end of each day, weigh the kilograms of organic waste produced (minus the weight of the bin) and complete Table 2 with the daily kilograms of waste produced.

Observation

According to the Food and Agriculture Organization of the United Nations (FAO), an average person can generate about 0,74 kg of organic food waste per day. It is important to note that this figure may vary depending on eating habits, lifestyle and other individual factors.

3. Continue your measurements for a week, completing the Data Table daily.
4. After you have completed your measurements, add all the kilograms to find the total weight of organic waste produced in a period of the week in your household.

Scale configuration

5. Calculate how many kilos are produced over the course of a year in your household and fill out Table 3 → kilograms per week x 52 = total kilos/year
6. Complete Table 3 by calculating the kilograms corresponding to each of the household members per year based on your own measurements → (Total kilograms per week x 52) ÷ household members = kilograms/ person/ year

Impact calculation

7. Fill in the first column of Table 4, multiplying the kilograms/person/year that you found in the previous step by the corresponding number of people in each unit (number of students of the class, number of students and teachers of the school, number of residents of the municipality, population of country, population of the European Union)

8. Using the equations below, calculate the emissions that will be produced from the total annual kilograms that you calculated in the first column of Table 4, in the case a) of landfilling and b) of composting, and fill in the second and third columns of Table 4.

A) Landfill: Kilograms of organic waste x 1.19 [kilograms of CO2e per kilogram of waste] = kilograms of greenhouse gas emissions [CO2e]

B) Composting: Kilograms of organic waste x 0.40 [kilograms of CO2e per kilogram of waste] = kilograms of greenhouse gas emissions [CO2e]

9. Calculate how many emissions could be saved per unit by composting → emissions from landfilling - emissions from composting

10. For the purposes of data production on food waste, calculate the average kg of waste/per student/per year → add the kilograms per person/year (from Table 3) of the whole class and divide it by the number of students. This number represents roughly the kg/person of produced food waste in your country, albeit extracted from a small sample.

FOODWASTE FACTSHEET

1 | General Information

Date	
County	
Municipality	
School	
Cooked meals	/ημέρα
Household members	

2 | Daily measurements

Day	Kilograms
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	
Day 6	
Day 7	
Week Total	

3 | Scale

Unit	Kilograms
Household / week	
Household / year	
Person / year	

4 | Impact calculation

Unit	kg/year	CO2e Landfilling	CO2e Composting
Household			
Person			
Classroom			
School			
Municipality			
Country			
EU			

5 | Emissions reduction through composting

Unit	Kg of CO2e
Household	
Person	
Classroom	
School	
Municipality	
Country	
EU	

6 | Data production

Total kg of class	kg/class/year
Number of students	
Classroom average	kg/person/year

ACTIVITY 2: Exercise to compare the result obtained when measuring one's own production of organic waste with the official numbers reported in student's country, and to reflect on the municipality's organic waste management plan vs practice.

Purpose of the activity:
The purpose of the exercise is to compare the results obtained from Activity 1, which is a primary source of information, with the official numbers on the production of organic waste management reported in the country and/or municipality and to reflect on any differences that might exist between the two. Beyond that, the purpose is also for the students to realise that national and municipal plans are often not implemented in practice, to reflect on the possible reasons behind this reality and think of ways they could themselves improve the situation as active citizens.

Duration of the activity: 2 hours
The duration of the activity should allow students sufficient time to collect information on organic waste management numbers and practices in their municipalities and analyse and compare the results.

Description of the activity:
Now that you have measured your own organic waste production, with precision and care, you may search and find the official numbers that exist for your country of residence, and if possible for the specific municipality you live in. If you cannot find the information online, you could contact the cleaning department of your municipality, which likely has this data and should be publicly available.
Compare and contrast your own finding of organic waste production per person (your classroom's average kg/person/year from Table 6) with those officially reported and try to think why, if at all, there are differences between the numbers.
Furthermore, with the same means as above, try to find your municipality's organic waste management plan and compare this with the reality of organic waste management in your municipality. How well does your municipality perform in terms of its organic waste management goals? What is lacking? How could you improve the situation? What would it mean in this instance to be an active citizen? Compare your Municipality's organic waste management plan with the Waste Management Plan that you created in the previous Topic (if you carried out the specific activity).

Evaluation Method: Assessment Through Participation and Reflection
In this approach, students' evaluation will focus on their active engagement with the module and their ability to reflect on their learning journey. The evaluation criteria will include:

Participation: Assess students based on their participation in discussions, group activities, and class exercises related to organic waste management. Encourage students to share their thoughts, ask questions, and contribute to group work.

Reflection: Ask students to maintain a journal or a reflective portfolio throughout the module. In this journal, they can document their understanding, insights, and personal reflections on each topic or activity. Consider these reflections as part of their evaluation.
For Activity 2, the teacher could ask the students to bring in class their findings from the search they carried out regarding the estimates of organic waste along with a written explanation answering the questions suggested in the Activity description, and any other questions that the educator deems appropriate taking into account the reality of organic waste management in their village/town/city.

Completion of Tasks: Assess whether students have actively participated in module activities, including the information search, the completion of the factsheet, and the closing activity. Completion of these tasks can be a criterion for evaluation**.**

Engagement: Evaluate students' willingness to learn from peers, and their ability to integrate new knowledge into their understanding of organic waste management.
This approach provides a more lenient evaluation method that emphasises students' active involvement and self-reflection rather than rigid criteria. It acknowledges that students may have varying learning paces and focuses on their overall engagement with the module.

TITLE: 3.A family approach: Empowering students and parents through waste management education
AGE FRAME: 14 -18 years old
HOURS: 8 hours (held in 3 months)

Information

The learning module "A Family Approach: Empowering Students and Parents through Waste Management Education" emphasises the symbiotic relationship between waste management education, students and their families. It emphasises the importance of instilling environmentally conscious habits in students and working with parents to promote appropriate waste management strategies. This module aims to inspire a shared commitment to environmental stewardship by empowering both parents and students to make waste management a comprehensive educational and household activity.

Educational objective and learning outcome

Educational objectives:

- Educate students to recognize the significance of proper waste management.
- Determine the typical types of home waste (such as toxic, organic, and recyclable).
- Cultivate habits and skills on how to reuse, recycle, and reduce waste.
- Understand the effects poor waste disposal has on the ecosystem.
- Encourage parents to practise eco-friendly waste management.

Learning outcomes:

- Students will be able to explain the importance of proper waste management.
- Students will accurately classify types of household rubbish.
- Students will put waste reduction techniques into practice.
- Students will explore the effects of inappropriate trash disposal
- Parents will gain experience in waste management programs

ACTIVITY 1 - Family Waste Audit Project:

Purpose of the activity: The primary goal is to raise awareness among students and their families about their contribution to waste generation. By conducting a food waste audit at home, students and families gain insights into their consumption habits and waste disposal practices.

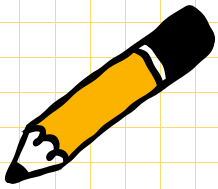
Duration of the activity: 1 week

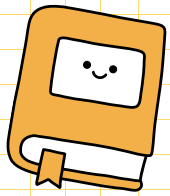
Description of the activity:
Begin by introducing the importance of food waste management and its impact on the environment. Emphasize the role families play in waste reduction and the collective responsibility we have toward sustainable practices.
Assignment (Take-Home):
Assign students the task of conducting a food waste audit at home with the help of their family members. Provide a simple checklist for different types of food waste and instructions on documenting the amounts over a specific period.
Follow-up (In Class):
Allocate time for students to share their findings in class.
Facilitate a discussion on the impact of their family's waste generation and identify potential areas for improvement.

ANNEX-Checklist paper

Description

As part of our waste management education initiative, we invite you and your family to participate in the Family Food Waste Audit Project. This hands-on activity aims to raise awareness about the types of food waste generated in your household and encourages thoughtful reflection on waste management practices. By documenting the daily waste produced over the course of a week, you'll gain valuable insights into your family's impact on the environment. Please use the following checklist to categorize different types of waste and consider this an opportunity to contribute to a healthier and more sustainable future.





Fruits and Vegetables & leftovers

- [ ] Unconsumed fruits
- [ ] Vegetable peels and scraps
- [ ] Uneaten portions of meals
- [ ] Expired or spoiled leftovers
- [ ] Spoiled milk or juices

Pantry and Perishables:

- [ ] Expired dairy products
- [ ] Unused or spoiled eggs
- [ ] Stale or expired bread
- [ ] Leftover cooked grains
- [ ] Expired or unused sauces

TITLE: 4. Organic waste reduction and reuse systems at school
AGE FRAME: 14-18
HOURS: 8 hours (holded in 3 months)

Information

With the objective of enhancing the school's municipal solid waste management model, this Teaching-Learning Sequence (TLS) puts forth the characterisation of the domestic waste bag and the on-site treatment of the organic fraction via composting in the educational garden. To achieve this objective, we recommend setting up and observing two compost bins. Students are encouraged to form research inquiries and suggest experimental designs to explore the bioreaction processes that enable the creation of models for the cycles of biodegradation. Through the use of tables, diagrams, and graphs and by reading scientific materials, students will be able to enhance their scientific skills.

Educational objective and learning outcome

Educational objectives:

- To improve the school model of municipal solid waste management.
- To develop a critical view on the need for new attitudes towards organic waste management.
- To propose research questions on the subject matter.
- To develop scientific skills.

Learning outcomes:

- Students will improve their ability to observe, investigate and offer answers to problems
- Students will work on critical awareness and will make a change of habits possible.
- Students will become aware of a reality that has not been visible up to now.

ACTIVITY 1 - Raising students interest in their consumption patterns

Purpose of the activity: Become aware of the amount of waste each family produces

Duration of the activity: 50 min

Description of the activity:
To start the sequence and focus it on the contemporary model of food production, consumption and waste, the teacher can use several photographs by the artist Peter Menzel, in which the weekly household consumption in different countries around the world can be visualised. A first question is posed to the students: "Which photograph do you most identify with? Normally, they identify more with Western consumption patterns: these are the images where food appears abundant, processed, from different geographical origins and, moreover, over-packaged. Next, the video The Story of Plastic (5 min) is shown in class, focusing on the management of plastic waste, a fraction of MSW (Municipal Solid Waste) that, due to its volume, is often mistakenly identified as the heaviest. From here, the teacher can guide a small discussion more focused on waste generation by asking the following prompt: "How many rubbish bins do you have at home? It is advisable to use real-time interactive applications (e.g. Socrative or Kahoot) using multiple choice questions.

ACTIVITY 2 - Composting of organic matter

Purpose of the activity: Learn how to manage a compost bin.

Duration of the activity: Some minutes per week during 3-4 months how to dispose of organic waste and a 45-minute session for the expert's presentation.

Educational objectives:

- To improve the school model of municipal solid waste management.
- To develop a critical view on the need for new attitudes towards organic waste management.
- To propose research questions on the subject matter.
- To develop scientific skills.

Learning outcomes:

- Students will improve their ability to observe, investigate and offer answers to problems
- Students will work on critical awareness and will make a change of habits possible.
- Students will become aware of a reality that has not been visible up to now.

Description of the activity:

After the previous activity, students should bring part of the organic fraction of their household waste to the school (last three days). On this day it is advisable to set up a container in the garden to deposit the organic waste and avoid bringing it into the classroom. With the help of the teacher, the compost bin is assembled, the organic fraction obtained is introduced and mixed with shredded pruning waste.

At this point, teacher and students should decide how to feed the compost bin during the following weeks until it is full, establishing some guidelines (time and how to proceed) for this. It may be advisable to read the instructions of the composter and follow its advice regarding feeding, timing, etc. If the school has a canteen or cafeteria, you can try to get your organic fraction into the compost bin. Or perhaps students can continue to bring it from home. The follow-up process lasts 3 to 4 months.

In the meantime, the teacher or an expert will explain the different phases (two mesophilic and one thermophilic), what the biodegradation process is like and the agents involved, as well as the possible problems arising from poor management. Subsequently, waste vs. resources will be reconsidered, the benefits of in situ management of organic waste in mitigating the effects of climate change will be emphasised, as well as how to obtain high quality compost and its application in the garden as a soil improver.

ACTIVITY 3 - Proposal for systematic observation

Purpose of the activity: Conduct research on the factors that affect the development of the compost bin.

Duration of the activity: Some minutes per week during 3-4 months (the same as in Activity 2) and a 50-minutes session.

Description of the activity:
Composting processes offer several opportunities for the observation and monitoring of a good number of parameters, as well as the subsequent experimentation with control of variables when a prediction derived from a hypothesis is to be checked. As this is a lengthy process (months) and is alien to most of the students, it is advisable to carry out a first phase of systematic observation, prior to the inquiry.

In this case, it is proposed that, each time organic waste is added during the process (3 months minimum), the values of at least the following parameters should be noted: kg of organic waste added (scales), temperature (thermometer), height of the pile (metre), whether or not it has been watered and the organisms observed. To do this, the teacher can organise small groups that alternate in the management of the composters (collection, supply and mixing of organic matter) and are responsible for observing and recording the values of these parameters in a table next to the composter or an online spreadsheet. At the end, the students should process the data obtained collaboratively and represent them graphically, drawing some initial conclusions (total mass of waste managed, temperature, gain and loss of the height of the pile, number of times it is watered and types of organisms that appear in the pile over time, etc.) and submit a small report to the teacher.

In the meantime, the teacher or an expert will explain the different phases (two mesophilic and one thermophilic), what the biodegradation process is like and the agents involved, as well as the possible problems arising from poor management. Subsequently, waste vs. resources will be reconsidered, the benefits of in situ management of organic waste in mitigating the effects of climate change will be emphasised, as well as how to obtain high quality compost and its application in the garden as a soil improver.

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Duration of the activity: Some minutes per week during 3-4 months (the same as in Activity 2) and a 50-minutes session.

Description of the activity:
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In this case, it is proposed that, each time organic waste is added during the process (3 months minimum), the values of at least the following parameters should be noted: kg of organic waste added (scales), temperature (thermometer), height of the pile (metre), whether or not it has been watered and the organisms observed. To do this, the teacher can organise small groups that alternate in the management of the composters (collection, supply and mixing of organic matter) and are responsible for observing and recording the values of these parameters in a table next to the composter or an online spreadsheet. At the end, the students should process the data obtained collaboratively and represent them graphically, drawing some initial conclusions (total mass of waste managed, temperature, gain and loss of the height of the pile, number of times it is watered and types of organisms that appear in the pile over time, etc.) and submit a small report to the teacher.

ACTIVITY 4 - Research

Purpose of the activity: Prepare an experimental design on the subject.

Duration of the activity: Two 50-minute sessions.

Description of the activity:
The first phase of systematic observation is expected to help students select a variable on which they can pose a research question, and propose an experimental design. The teacher asks the groups to present the final conclusions from the observations made, and asks them individually to propose an experiment using a research question. One of the most difficult aspects of research is to formulate a research question from their observations that can be answered with the means available. Examples of good research questions would be:

- Does the location of the compost bin, sun or shade, influence the process and the maximum temperatures reached?
- How many kg of compost are generated by 100 kg of organic waste?
- Does the type of structuring agent used influence the occurrence of macrofauna (earthworms, crustaceans, insects, ...)?
- What is the effect of physical factors (e.g. air flow, or size of composting bin) on the maximum temperatures reached in composting?
- What effect does putting on or removing the lid have on the composting process?

In groups, students compare their questions with each other and discuss the feasibility of their questions, decide which question to address, and draft an experimental design. Controlled experiments are carefully designed to include clearly defined objectives and hypotheses, and dependent, independent and control variables. In either case, students would vary only one independent variable (e.g. compost bin with or without lid), holding all other variables constant (e.g. size, ingredient mix, ambient temperature and other factors).

Let us assume that the starting hypothesis for the first research question is that "The insulation (independent v.) influences the T°max (dependent v.) of the system and thus the composting process". A suitable experimental design to test this would consist of: "Put the remains of the organic fraction of the household waste in two identical compost bins, but in different locations (e.g. sun and shade), in equal amounts and adding the same amount of thickener. Air them with equal frequency and intensity and water them once a week (otherwise it would not be known whether the effect is due to the location or the watering). The following parameters are recorded periodically: kg of organic waste added, temperature, height of the pile and organisms detected.

Evaluation

Evaluation Method: Assessment Through Participation and Reflection
In this approach, students' evaluation will focus on their active engagement with the module and their ability to reflect on their learning journey. The evaluation criteria will include:

Participation: Assess students based on their participation in discussions, group activities, and class exercises related to organic waste management. Encourage students to share their thoughts, ask questions, and contribute to group work.
Reflection: Ask students to maintain a journal or a reflective portfolio throughout the module. In this journal, they can document their understanding, insights, and personal reflections on each topic or activity. Consider these reflections as part of their evaluation.

LetFor the evaluation of the work carried out in this subject, two fundamental questions must be assessed. Firstly, the attitude to the subject, the sensitivity to the problem and the level of empathy developed will be evaluated (objectives 1 and 2). To do this, the attitude will be observed during the process, and questions may be asked during the classroom sessions. Some examples:

- What do you think about waste management?
- What consequences do you think composting as a common household practice could have in the future?
- How important do you think it is to have knowledge about the processing of organic waste?

Completion of Tasks: Assess whether students have actively participated in module activities, including the information search, core topic activities, and closing activities. Completion of these tasks can be a criterion for evaluation.
Engagement: Evaluate students' willingness to learn from peers, and their ability to integrate new knowledge into their understanding of organic waste management.

This approach provides a more lenient evaluation method that emphasises students' active involvement and self-reflection rather than rigid criteria. It acknowledges that students may have varying learning paces and focuses on their overall engagement with the module.

TITLE: 5. From the classroom to sustainable actions
AGE FRAME: 14-18
HOURS: approximately 7 hours + observation time (4-5 weeks)

Information

The emphasis on environmental education (EE) varies by country. Some countries have already integrated EE into their education systems, while others are just starting. The result is different levels of EE knowledge in schools.
It is important for young people to acquire EE-related skills and to put them into practice, thereby developing a deeper appreciation for sustainable waste practices and cultivating a sense of responsibility and good citizenship. Integrating EE into subjects like biology, geography, chemistry or even art allows students to see the intricate connections between ecological processes and human behaviour.

Educational objective and learning outcome

Educational objectives:

- To explore the anaerobic decomposition of organic waste and its role in methane production, understanding the potential of organic waste as a renewable energy source
- To connect knowledge from biology, chemistry, and geography in order to explain the decomposition process of organic waste.
- To encourage students to connect the findings of the experiment to real-world environmental issues, promoting awareness and responsibility.

Learning outcomes:

- Students will engage in collaborative learning by participation in group discussions and sharing their insights
- Students will develop observation and data collection skills
- Students will gain practical experience in conducting a scientific experiment.
- Students will improve their communication and presentation skills.

Activities

ACTIVITY 1: What I already know

Material:

- sheet of paper
- pen

Purpose of the activity: review your existing knowledge on the topics

Duration of the activity: 45 min

Description of the activity:

- Divide students into groups
- Each group gets a sheet of paper and a pen
- Each group writes, possibly in the form of a thought pattern, what they have already learned about environmental education in specific subjects such as geography, chemistry and biology
- Each group presents their work
- A joint discussion on what has already been learned

ACTIVITY 2: Comprehensive factors in organic waste decomposition

Theoretical basis:
Organic waste decomposition is a natural process that involves the breakdown of organic materials, such as plant matter, food scraps, and other biodegradable substances, into simpler forms. This process is influenced by a variety of interconnected factors, which can be broadly categorised into biological, chemical, and geographical aspects.

Material:

- Various organic waste material (fruit peels, vegetable scraps, leaves, ...),
- Compostable or biodegradable containers,
- markers,
- ruler or measuring tape,
- weather instruments (thermometer, hygrometer)
- soil testing kit (pH, moisture)
- maps and satellite images of the study area
- pH and temperature probes
- notebook,
- cameras (optional)

Purpose of the activity:
Connect knowledge from biology, chemistry and geography to explain the decomposition process of organic waste, its impact on ecosystems, and geographical factors influencing decomposition rates.

Duration of the activity: 2 sessions + 4 weeks for observation

- Introduction: 10 minutes
- Group formation and assignment: 10 minutes
- Waste audit and setup: 30 minutes
- Ongoing observations (4 weeks): Regular check-ins during classes
- Data analysis and discussion: 30 minutes
- Proposal of practical solutions: 30 minutes

Description of the activity:

- Introduce the concept of organic waste decomposition and its interconnected factors: biological, chemical, and geographical.
- Provide each group with two clear plastic bags and assign them with specific organic waste materials
- Instruct groups to place the organic waste into a container and place one container in a shaded area and one in a sunny spot.
- Encourage the students to observe and document any sign of biological activity (insects, worms, fungi) around the containers -biological factor
- Use magnifying glasses to examine microorganisms on the waste – biological factor
- Measure ph and temperature of any liquid produced within the containers – chemical factor
- Monitor and record temperature and humidity levels at each geographical location using weather instruments – geographical factor
- Observation period: 3-4 weeks
- Encourage students to take photos and notes on changes observed, both within the containers and surrounding environment
- Assist students in analysing the collected data to identify the relationship between biological, chemical and geographical factors and decomposing rates.
- Encourage students to propose practical solutions and strategies for optimising organic waste decomposition based on the observed factors.

ACTIVITY 3: Investigating Methane Production

Theoretical basis:

Anaerobic decomposition and methane gas production

Anaerobic decomposition is a process where special bacteria break down dead plants and animals in places where there's very little or no air, like deep in lakes, swamps, or under piles of garbage. These bacteria are pretty unique because they don't need oxygen to live. Instead, they eat up the dead material and, in doing so, they produce different gases as waste. One of these gases is methane, which is a type of gas that you can't see or smell, and it is made of carbon and hydrogen.

Methane is interesting because it can be both useful and problematic. On the one hand, we can use it for important things like making heat and electricity, just like natural gas. This is great because it means we can turn waste into something valuable. But on the other hand, when methane goes up into the sky, it can trap heat from the sun and make the Earth warmer. This is part of what people talk about when they discuss climate change and global warming.

So, understanding how bacteria can turn dead stuff into methane shows us a lot about how nature recycles and how science can help us both use resources wisely and take care of our planet. It's a cool example of science in everyday life and how little things, like bacteria, can have a big impact on our world.

Materials:

- Plastic bottles or containers
- Organic waste
- Water
- Balloons
- Rubber bands

Purpose of the activity:

Proof that the decomposition produces a gas that can be used as a fuel because it is flammable.

Duration of the activity: 1 session + 2 weeks observation period

- Introduction: 10 minutes
- Setup of methane production experiment: 20 minutes
- Observation period: 2 weeks or until the gas builds up
- Measurement of gas volume and discussion: 30 minutes
- Attempt to ignite the gas (outdoors, with safety precautions): 20 minutes

Description of the activity:

- Discuss anaerobic decomposition and the production of methane gas.
- Fill a plastic bottle with different organic waste and water, leave the same space at the top
- Stretch a balloon over the mouth of the bottle and secure it with a rubber band
- Place the bottle in a warm, dark place and observe over a few days.
- As the organic waste decomposes, methane gas will be produced and inflate the balloon.
- Measure the volume of gas collected in the balloon.

ACTIVITY 4: Waste Impact Analysis

Theoretical basis:

The interconnectedness of ecosystems is a fascinating topic. It's all about how different parts of nature are linked together and depend on each other. In every ecosystem, which is like a community of living things and their home, there are plants, animals, and other organisms, each playing their own special role.

Think of an ecosystem like a giant, complex puzzle. Every piece is an organism, like a bird, a tree, or even a tiny bacteria, and each has its own job. Some plants and trees provide food and oxygen, while animals might help spread seeds or keep other animal populations in balance.

Then there are habitats, which are like the different rooms in a big house. Each room has its own purpose and conditions. For example, a forest is a habitat with lots of trees, while a pond is a habitat with water and aquatic life. Each habitat has its own set of conditions like light, temperature, and moisture, which are perfect for certain plants and animals.

But it is not just about living things. Environmental factors, like weather, the amount of sunlight, and the type of soil, also play a huge role. These factors can change how an ecosystem works. For example, if it doesn't rain for a long time, a forest might become dry and more prone to fires, which can then change the whole ecosystem.

Materials:

- Whiteboard or large poster paper
- Markers
- Internet access

Purpose of the activity:

To understand the impact of waste on ecosystems and encourage behavioural change.

Duration of the activity: 90 min

- Introduction: 10 minutes
- Ecosystem assignment and research: 60
- Presentations and class discussion: 20 minutes

Description of the activity:

- Begin by discussing the interconnectedness of ecosystems, emphasising the roles of organisms, habitats, and environmental factors.
- Introduce the concept that pollution, including organic waste, can disrupt ecosystems.
- Divide the class into small teams.
- Assign each team a specific type of ecosystem (e.g., forest, wetland, ocean)
- Teams should try to find out through personal research how different types of waste affect their ecosystems.
- Engage the class in a discussion about the impact of organic waste on ecosystems.
- Challenge students to think about how they can contribute to reducing waste and protecting ecosystems.
- Discuss practical steps they can take in their daily lives to promote responsible waste management.
- Have each team summarise their findings and present them to others.
- Reflect on the importance of responsible waste disposal and its role in preserving biodiversity and ecosystems.

Evaluation Method: Assessment Through Participation and Reflection
In this approach, students' evaluation will focus on their active engagement with the module and their ability to reflect on their learning journey. The evaluation criteria will include:

Participation: Assess students based on their participation in discussions, group activities, and class exercises related to organic waste management. Encourage students to share their thoughts, ask questions, and contribute to group work.

Reflection: Ask students to maintain a journal or a reflective portfolio throughout the module. In this journal, they can document their understanding, insights, and personal reflections on each topic or activity. Consider these reflections as part of their evaluation.

Completion of Tasks: Assess whether students have actively participated in module activities, including the information search, core topic activities, and closing activities. Completion of these tasks can be a criterion for evaluation.
Engagement: Evaluate students' willingness to learn from peers, and their ability to integrate new knowledge into their understanding of organic waste management.

This approach provides a more lenient evaluation method that emphasises students' active involvement and self-reflection rather than rigid criteria. It acknowledges that students may have varying learning paces and focuses on their overall engagement with the module.

Extra resources

ACTIVITY 1 - Raising students interest in their consumption patterns

https://www.menzelphoto.com/portfolio/G0000s3jj73.5TSs o
https://time.com/8515/what-the-world-eats-hungry-planet/
https://www.youtube.com/watch?v=iO3SA4YyEYU
https://www.socrative.com/
https://kahoot.com/
Bilbio gehiago bideekin https://www.fao.org/save-food/news-and-multimedia/videos/en/

ACTIVITY 3 - Proposal for systematic observation

https://www.lidl.es/es/compostador-300-l/p52704?channable=4068d16964003439383533343 4&mktc=shopping_shop&gad_source=1&gclid=CjwKCAiA9dGqBhAqEiwAmRpTC7DEw-e6nA21SNvXx5fk_eEm-IAO-D1n7Zi_7SD0b4JVr1i60HJ5ihoCLDUQAvD_BwE
https://cwmi.css.cornell.edu/compostingintheclassroom.pdf
https://www.plt.org/educator-tips/composting-tips-experiments-resources-classroom-home

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