Composting box

Summary

Age category
9 - 12 years
Topic
Data & Statistics
Total duration
720 minutes

Students explore different solids. They design and construct an optimal composting box. They calculate the price. They use their composting box.

Problems to be tackled:

- What can we do to clean the leaves from the yard? Can we use them?
- How can we use the food waste from the school canteen?
- How can we construct the best composting box to use those and others wastes?

Real context

Real world motivation

Autumn is a season of many changes and nature is full of colours calling for our attention, especially the leaves falling. Schools appeal for recycling and media are shouting for citizens to use bio products and decrease wastes. In schools food waste is a reality. Besides all that economical crises is a reality for many countries.

Goals

Skills

Domain-general:

Developing critical thinking skills;

- analysing arguments;
- judging the credibility of the sources;
- identifying the focus of a problem;
- answering, clarifying questions.

Mathematics:

Developing skills for problem solving, reasoning and mathematical communication:

- explaining and justifying mathematical processes, results and ideas;
- developing visualization and geometric reasoning and being able to use them;
- solving problems involving volumes and situations of resource optimization.

Science:

Developing Citizenship (Environmental Education / Sustainable Development):

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- promoting a process of environmental awareness and change of attitudes and behaviour towards the environment;
- using knowledge to interpret and evaluate the surrounding reality, to formulate and debate arguments, to support positions and options;
- stimulating active participation in decision-making based on the current world.

Knowledge

Mathematics:

- Solids. Volumes.
- Optimization of volumes of solids.
- Selection of materials, based on cost analysis and comparison, with a view to their reduction.

Science:

- Ground. Ground pollution. Measures to prevent soil pollution.
- Separation of waste. Reuse of waste.
- Environmental education and sustainable development.
- Composting.

Technology - Engineering:

- Construction of solids using different materials.
- Optimizing the volume of a box.

Methodology

Part	Description	Timing
1	**Message in images: Teacher's introduction** ***The teacher introduces the context of the activity*: Composting box.** The students solve a worksheet about food wastes and how to build a composter box. The discussion can be in a big group (all the class) or small group (3/4 students) with the worksheet depending on the level and the students.	90'
2	**Research of composting advantages: group work** ***Groups investigate and choose the design for their composting box.*** in small groups: After the investigation about composting and composting boxes each group design the composting box they think is the best considering the optimization of volume, type and price of materials and sparing costs.	180'
3	**Presentation of designs and decision about the composter to be build: group discussion** The groups present their result of the research and project design for the class and discuss about the best choice for the final project of composting box.	90'

4	**Construction of the composting box: Teacher evaluates** The teacher decides how to organize the groups and gives tasks for the construction of the composting box.	270'
5	**Final assessment** The final assessment is made in small groups about the way they worked together and individually about how each one enriched the team work.	90'

Organization

Materials

- Computer and internet
- Books
- Rulers, glue, scissor (one for each group)
- Paper worksheets (see printables)
- Supermarket brochures with prices of materials
- Material for the class project (depends on the project but can be: tires, pallets, wire, nails,...)

Grouping

Groups should be organized considering students' abilities, math and manual skills.

Printables

Worksheets for the children

Coaching

Useful questions

Engage, Part #1

- What message is intended to be transmitted by the images?
- What means the message "If we divide waste we all will win"?
- Give examples of materials that are separate in your school.
- "My grandfather has a bunch in the yard with leaves and other stuffs." Why do you think John's grandfather does that?
- In your school leaves, food waste and other materials are separate? Are there any composters to do that?
- If not, what can you do to compost wastes in your school?

Engage, Part #2

- What's the advantage for the environment?
- What materials (waste) can we use in composting?
- Where can we use the final product of the composting box?
- What's the benefit to your health?
- Is there any economical advantage?

Investigate

- What kinds of composters are there?
- What's the best solid (cylinder, prism…) to optimize the interior volume?
- What kind of materials (wire, wood,…) can we use?
- What's the cheapest option?
- Which project presents the best composting box (more interior volume and cheapest)?
- How are you going to put the materials inside the box?
- How are you going to take out the fertilizer (composted materials) from the composter?
- Do you think you need a way to move the composter? How?

Plan / Create

- The questions will depend on the project and the students difficulties allowing them to construct one good composting box with security.

Report

- How did the group worked?
- How did you contributed to the group work?
- What were the biggest difficulties that your group faced?
- How did the group overcome the difficulties?

Adaptations

In earlier ages and classes with more difficulties the teacher can be more explicit and give a couple of options about the solid and the material (see useful questions).

For ages 9-11 solids exploration for the composting box will be about different prisms and teacher can give the option "wire versus wood" and the price of each so students can analyse only those options.

For ages 11-12 it will be an open exploration. Students also have to analyse the cylinder and they propose materials and research costs.

Assessment

Teacher's assessment:

- Schedule adequate
- Students motivation and participation
- Research work relevant to the theme
- Group collaboration
- All the groups have presented an adequate project
- Cooperation of all the class to construct the composting box

Student's assessment:

Group work

- Individual contribution to the work
- All the task completed on time
- Biggest difficulties
- Ways to overcome the difficulties

Tips & tricks

- Be attentive to composting's laws of your country.
- You can invite a specialist in composting or organic farming to explain the benefits of composting and care in the construction and use of the composter.
- You can invite the art teacher to participate in the beginning of the project with an wall art of leaves.
- You can ask the local recycling centre to be your partner on this Project by giving some materials.
- You can define with your students the maximum volume of the composting box.
- Your students can be invited to construct a small model of the composter box to present to the class.
- You can use *Tinkercad* to simulate your composting box.
- You can motivate your students for the need of constructing an appealing composter box. For example with graffiti.
- You need an iron network to put at the bottom of the composter.
- It's important to have an opening at the top or side of the composting box to put inside the composting materials and at the bottom to take out the fertilizer.
- You can construct mobile gardens or boxes with aromatic and medicinal plants fed with you own fertilizer and that you can sell or use in your school.

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