

Long Teaching Sequence
For students aged 13 to 14

Can the life cycle of plastics be circular?

Author:

Marina Rezende Lisboa



TECHNICAL SHEET

Topic The life cycle of plastics in the Circular Economy.

Summary Students will do some research on the life cycle of different types of plastics and should propose, in groups, 10 measures for a more circular process, in the present and for the future, emphasizing the return of plastic waste throughout the production, consumption and disposal process.

Suggested audience Students aged 13 to 14 years.

Estimated length Six classes.

Materials Computers with internet access, canson A4 paper, markers and rulers.

Curricular components Geography, History, Arts and Sciences.

Learning objectives

Concepts: Production, consumption, disposal, technical cycle of plastics and Circular Economy.

Procedures: Individual research and group investigation; data collection and analysis; search and mapping of proposals for a more circular plastic life cycle.

Attitudes: Recognition of the value of teamwork. Respect for different points of view. Empathy. Recognition of the importance of social and environmental justice. Assessment of the facts and improved notion of citizenship.

Keywords Circular Economy, production process, plastic.

Related SDGs



SUMMARY OF STEPS

1. Exploring

To start, have the students watch an introductory video on the topic of plastics and then another on the life cycle of plastics. After providing some context, the Teacher will launch the challenge that will guide the work of the following classes: **How can the life cycle of plastic products be circular?** The class will be divided into groups and each will research a type of plastic and its life cycle (production, consumption and disposal).

2. Investigating

In the classroom, each group should share the collected information with the other members and together they should systematize and compile the most relevant data on plastics: raw materials, manufacture, products made of this material and the possibilities of reuse and recycling throughout their life cycle.

3. Finding a solution

Students should reflect on the information they found and propose 10 measures to make the production-consumption-disposal process more circular, considering the tripod. It is worth remembering that the proposed measures should also take into account the reality of the school, especially with regard to consumption and disposal, that is, how the school can also become more circular in relation to the use of different types of plastics.

4. Sharing

Each group will present the class with the measures they envisioned to enable a more circular life cycle for the researched types of plastic. The class will identify the common and most relevant measures for all of them and create a single board addressing the challenge of the sequence. The board can be shared on social media with the school community, parents and staff.

STEP BY STEP

Introduction

We know that plastic is a fundamental material for life in contemporary society. It is difficult to imagine the world without plastic today. However, today, 98% of the plastic we produce is made of oil. So what will we do when this raw material becomes scarce? Furthermore, much of this plastic turns into garbage and goes to landfills, dumps and the environment.

We must urgently think about solutions to these problems. The Circular Economy presents possibilities for the best use of this resource, including using things for a longer time, reusing product components, recycling or finding alternative materials.

Thinking about concrete measures to make these products' life cycle more circular is a good exercise to help us make progress in this direction. That is what this Teaching Sequence is about.

Recommendation:

Introductory class on Circular Economy

Before going about this Teaching Sequence, we recommend conducting the [introductory activity on Circular Economy](#). This step is important to present the main concepts related to the topic.

1. Exploring

CLASS 1

Providing context | 25 minutes

Start the class by introducing the topic of plastics, which will be addressed throughout this Teaching Sequence, and play the following video:

- [Plastic pollution in numbers and images](#) (3:22 minutes)

link: encurtador.com.br/axJN6

Ask students to comment on what they have watched using a thinking routine called:

"I see, I think, I wonder"

To do this, pick 3 or 4 students to talk about what caught their attention in the video, following the sequence of the proposed thinking routine. In other words, students should talk about what they learned from the video and what stood out, their thoughts during the exhibition and any new questions emerged from this analysis. Open the conversation so that everyone in the room can try to answer the questions that come up.

Life cycle concept | 5 minutes

Give a brief explanation of what is meant by a product's life cycle. To facilitate the understanding of the concept, use the "Life Cycle Assessment" video available at:

- [Life Cycle Assessment](#). (4:03 minutes)

link: encurtador.com.br/qxFO4

Challenge and group work | 15 minutes

Tell them that over the next classes you will work on a project with the objective of meeting the following challenge:

How can the life cycle of plastic products be circular?

Divide the class into 4 groups. When forming the groups, try to ensure that each has people with different skills (for example, writing, research and communication).

Explain that each group will work with a specific type of plastic, whose characteristics are as follows:

- Group 1: products made of PET (polyethylene terephthalate) and PVC (polyvinyl chloride)

- Group 2: products made of HDPE (high density polyethylene) and LDPE (low density polyethylene).
- Group 3: products made of PP (polypropylene) and PS (polystyrene)
- Group 4: products made of PU (polyurethanes) and EVA (ethylene vinyl polyacetate)

Guidance for the groups' research | 5 minutes

Explain how groups should do their homework.

AT HOME

Tell students to do some research on the type of plastic assigned to their group at home, looking for products made of it and their possible disposal and reuse destinations.

For this research, we suggest the following guiding questions:

1. What is the main raw material used in the manufacturing process of this plastic?
2. What is the production process of this plastic like? Is it possible to identify what types of waste are generated?
3. Can this waste be reused within the production process itself?
4. In what everyday products can this type of plastic be found?
5. Is there any other material that could replace the plastics we consume in these products?
6. What is the best way to dispose of this type of plastic?
7. Can these products be recycled or reused in any way?

Tell students that their research results should be brought to the next class. Emphasize that the more information they find, the more solid the work to be done in the next class will be.

2. Investigating

CLASS 2

Sharing research information | 15 minutes

The information they collect should circulate among the members of the group. To do this, ask each student to explain what they found about the life cycle of the type (or types) of plastic they researched. Help the class set up this presentation in a way that addresses aspects of production, consumption and disposal.

Systematizing the research | 35 minutes

After sharing the information, the students should compile the most relevant data in a single document, which should contain the answers to the research questions, as a homework assignment.

In the last 5 minutes, students should make arrangements to search for any missing information at home.

Important tip:

To encourage information sharing among the 4 work groups, you may use the Wall feature of Padlet, a free online teaching tool. There, everyone can see each other and learn about their work. This can be done as a homework assignment.

Evaluation

Make sure that the groups are on the right track by paying close attention to how they discuss the topic, share their research and systematize information.

It is important to encourage the participation and engagement of all group members. If any student is sidelined, assign him/her tasks that can include keeping time, listing the researched websites to prepare the bibliography and mediating cases of disagreement.

3. Finding a solution

CLASS 3

Additional information | 10 minutes

Start the class by organizing the four groups and ask the students to complete the systematization started in the previous class with the information found in their home research.

Solving the challenge | 40 minutes

Afterward, write the challenge on the board again:

How can the life cycle of plastic products be circular?

Tell students that, based on everything they have researched and talked about, they now have to:

Suggest 10 measures to turn the production, use and disposal of their type of plastic into a more circular process.

In other words, they should come up with proposals to minimize or eliminate the need for non-renewable natural raw materials and also minimize or eliminate the generation of waste that will return to nature (keeping in mind the consumption-related processes in between).

Important tip:

To facilitate the activity, encourage students to research actual cases from Brazilian and/or foreign companies, as well as public policies adopted in other countries with the aim of making the economy more circular.

CLASS 4

Completion of the 10 measures | 25 minutes

In the first part of this class, students should finish the draft of the 10 measures proposed for the circular production of each group's type of plastic.

Preparing the presentation | 25 minutes

In the next 25 minutes, students should put the suggested measures in writing on a sheet of paper, according to the template:

GROUP _____

Measures for a more circular economy of the following type(s) of plastic _____.

1. _____

2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

It is very important that, in the last minutes of this class, the 10 measures of each group have been shared with the whole class. To do this, post the sheets of paper on the board so that everyone can read the measures and, if possible, make suggestions.

Evaluation

Observe the suggestions that come up. Make sure they are feasible. Also, pay attention to the questions asked and analyses made by the students so you can make an oral evaluation. These questions and analyses will show whether or not the students understood the proposal of the project.

4. Sharing

CLASS 5

In this class, all the knowledge acquired in the four previous classes will be shared through the presentation of the proposed measures.

Project presentation | 20 minutes

Organize the class so that the groups present themselves in the following order: first group 1, then group 2, and so on. Each group will have a maximum of 5 minutes for their presentation, including the presentation itself and questions from other students in the room.

Project compilation | 30 minutes

In the last 30 minutes, the class should go over the information presented and find common suggestions that can be used for any of the types of plastic under study. This should result in a list of 10 items that apply to all types of plastic.

Suggestion: the 10 selected measures can also be used in a large drawing representing the life cycle of plastics, similar to the infographic of the technical cycle analyzed in the beginning of this Teaching Sequence.

CLASS 6

Reflection on the results | 30 minutes

Again, start the class by writing the challenge on the board:

How can the life cycle of plastic products be circular?

Start a conversation circle by asking students whether or not the project met the challenge. Students are expected to realize that the common suggestions identified at the end of the previous class meet the challenge. Reflecting on the activity they performed is part of their learning process.

Bringing theory and practice together | 20 minutes

Propose that students put their new knowledge into practice by planning a program to implement in the school, with measures that may contribute to the circular consumption of plastics within the school community.

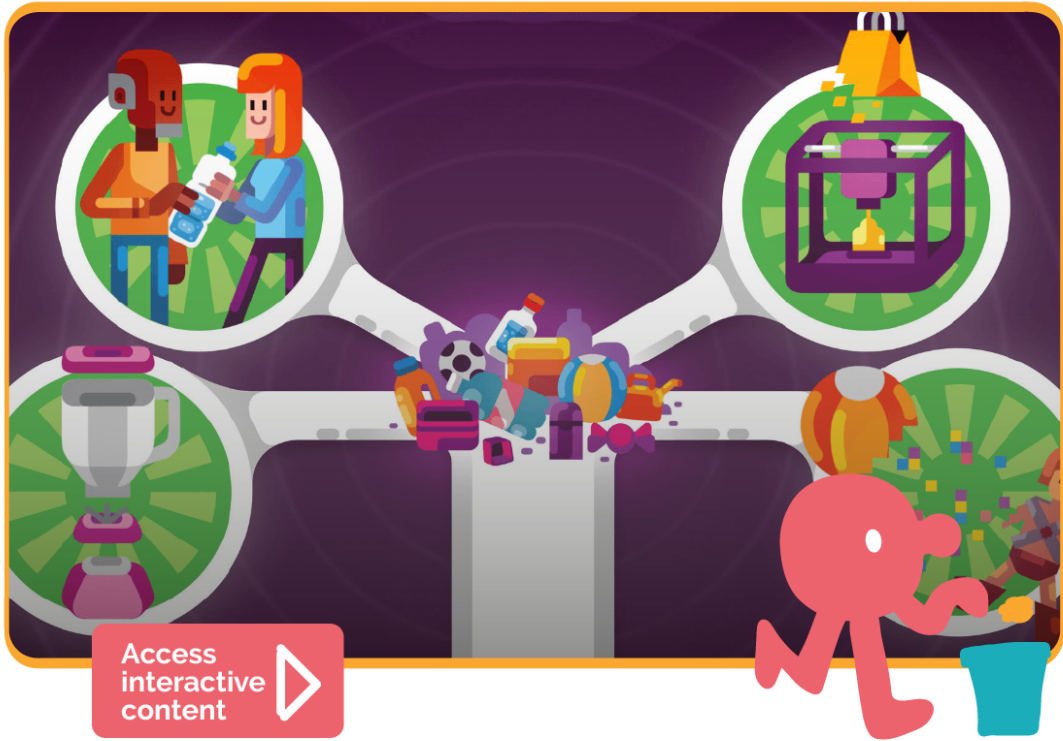
For this, the common suggestions identified by them should be written on a virtual board that can be shared on the social media of the school and community.

Evaluation

All the steps of this Teaching Sequence are subject to evaluation, as highlighted below:

1. Analysis of the research done in the exploration and investigation steps;
2. Measures created in the solution finding step;
3. Development of critical and argumentative skills based on concepts, data and information;
4. Analysis of the common board and sharing strategies.

In this way, you can assess your students' understanding of the social, economic and environmental advantages enabled by the Circular Economy.



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REFERENCES

Videos:

Circular Economy: rethinking progress

<https://www.youtube.com/watch?v=OWxy4PXq2pY>

Meet the people rethinking ownership

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

NGO Global Footprint Network calculates humanity's Ecological Footprint.

<https://www.youtube.com/watch?v=SD4zArzv96s>

Meet the people rethinking ownership

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

Plastic pollution in numbers and images

https://www.youtube.com/watch?time_continue=8&v=O2OoJO85VuE&feature=emb_logo

Life Cycle Assessment

<https://www.youtube.com/watch?v=SkHE2clxv0U>

Precious Plastic Universe: a big bang for plastic recycling

https://www.youtube.com/watch?time_continue=98&v=Os7dREQ00l4&feature=emb_logo

Websites:

Circular Economy - UK, USA, Europe, Asia & South America - The Ellen MacArthur Foundation

<https://www.ellenmacarthurfoundation.org/>

The Circular Design Guide

<https://www.circulardesignguide.com/>

New Plastics Economy - The Future Of Plastics - New Plastics Economy

<https://www.newplasticseconomy.org/>

Circulate News - Medium

<https://medium.com/circulatenews>

Circular Idea - Circular Design and Economy in Brazil

<https://www.ideiacircular.com/>

A Big Bang for Plastic Recycling

<https://preciousplastic.com/>

Texts and documents:

What is Cradle to Cradle?

<https://www.ideiacircular.com/o-que-e-cradle-to-cradle>

What is Circular Economy?

<https://www.ideiacircular.com/economia-circular/>