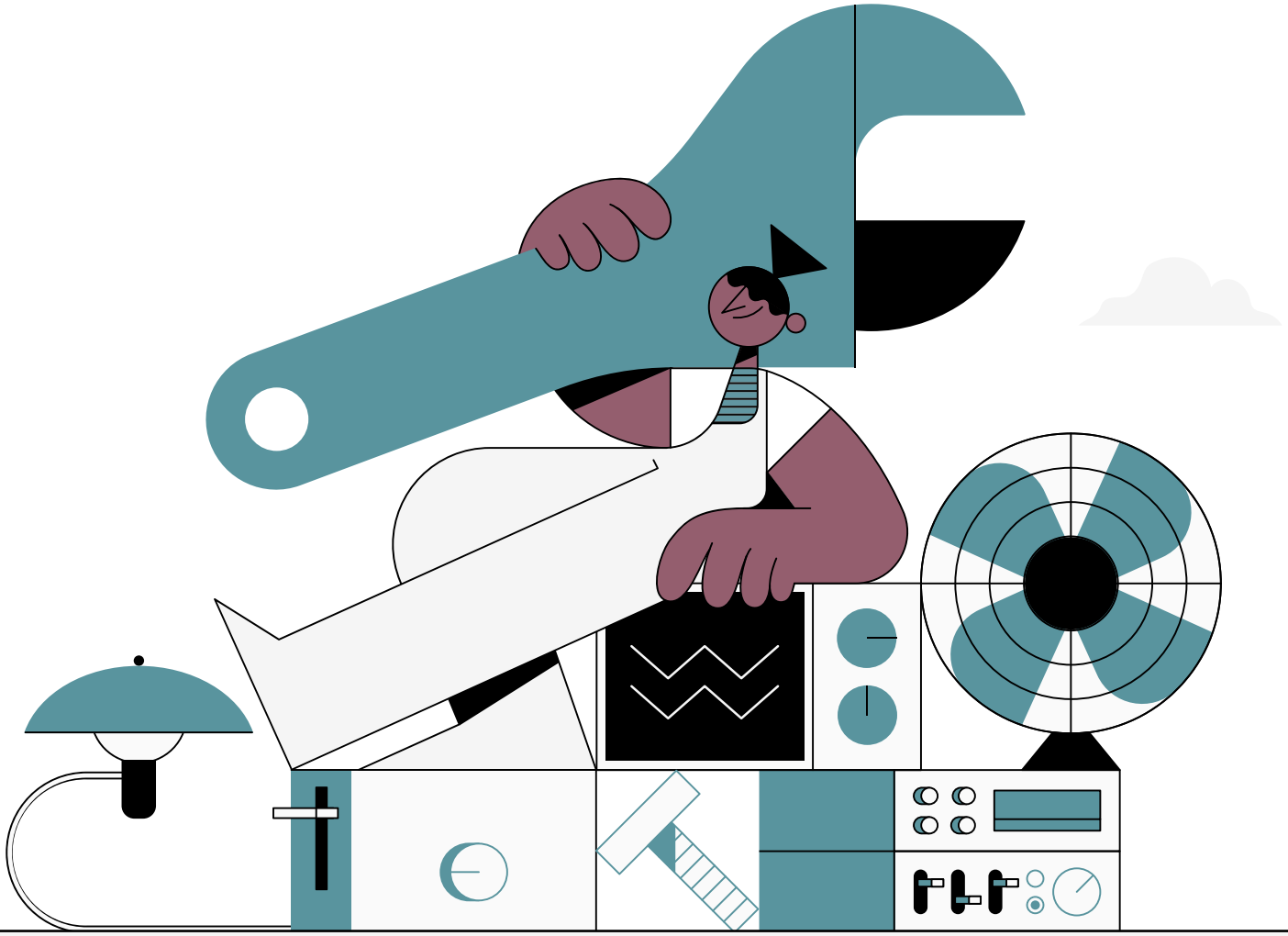

MAKE IT WORK!

A teaching pack on repairing electrical and electronic devices

Interreg North-West Europe SHAREPAIR
djapo
België partner in ontwikkeling
Vlaanderen verbeelding werkt

BACKGROUND INFORMATION

TABLE OF CONTENTS

INTRODUCTION Repairing electrical and electronic devices[1] and thereby extending their lifespan makes you part of the circular economy. It is an effective way to contribute to a more sustainable future. This educational pack is presented to you by Djapo and Sharepair to raise awareness about this issue among children and adolescents and help them recognize opportunities to repair devices in their daily lives. We want to encourage students to become committed to choosing repair, both at school and beyond.

This document containing background information is intended for you as a teacher, and helps you to prepare the lessons. It familiarizes you with the basic principles of electrical and electronic repair by giving you the what, why and how. The first part introduces the wider concepts of sustainability and the circular economy, and then focuses on repairing electrical and electronic devices. The second part covers Education for Sustainable Development and the didactic principles that underlie the pack's teaching materials. It clarifies the modular structure of the teaching pack and the intended learning process behind the steps required to engage students. It also contains tips on working with English as an Additional Language (EAL) students.

1 ~ The word 'device' is commonly used to refer to smaller electronic products such as smartphones or laptops. For larger domestic electronical products such as washing machines and fridges, the word 'appliance' is more common.

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CONTENT-RELATED BACKGROUND INFORMATION

1.1 – Sustainability

Sustainable development means taking care of the earth and of humankind. The natural resources of the earth are the basis for what we need as human beings to survive. Everyone, regardless of where they live, has the same right to the natural resources they need to meet their basic needs. At the same time, natural resources are precious, and future generations require to be able to enjoy them equally. This is why it is necessary to treat them sustainably, including in commercial industries. This helps to realize a world in which everyone can enjoy the right to live in dignity on a healthy planet.

This harmonious equilibrium between the social, ecological and economic realms can be summarized by the three Ps of sustainable development. Sustainable stewardship means:

- avoiding negative impact on other people, their way of life and their chances of a dignified existence (**People**);
- avoiding negative impact on the carrying capacity of the planet (**Planet**);
- contributing to social prosperity (**Prosperity**).

Two further Ps were added in the United Nations' 2030 Agenda for Sustainable Development to clarify the conditions required to work on sustainable development: **Partnership** and **Peace**.

After an intensive development process, the United Nations translated the three Ps of sustainable development into 17 Sustainable Development Goals or SDGs. The international framework of the SDGs has been proposed as a new global plan to make the planet a healthier, more just and more peaceful place for all. The framework reflects a shift from the classical 'North-South' divide to a more global perspective. All world leaders will have to make concrete efforts to realize these development goals by 2030. You can find more information about the SDG framework here.

Source: https://www.un.org/sustainabledevelopment/news/communications-material/

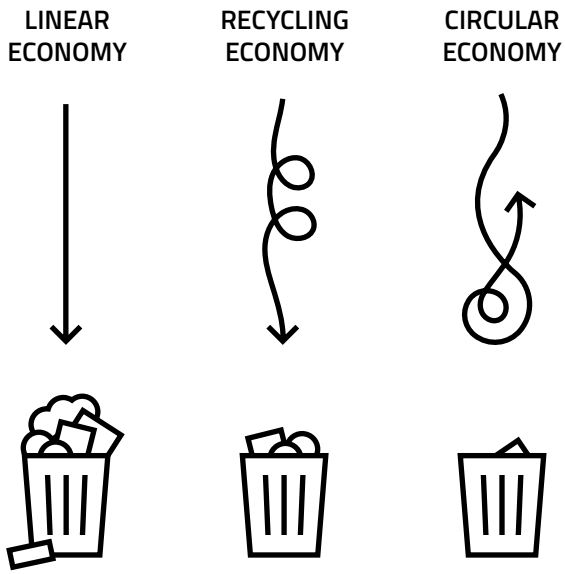
1.2 – The circular economy and repair

The current global economic model cannot sufficiently guarantee that future generations will also be able to enjoy the earth's natural resources fully to meet their basic needs. The need for a different economic model is obvious, a model in which we use materials and products sustainably.

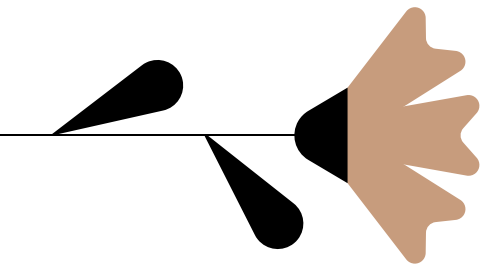
1.2.1. – What is a circular economy?

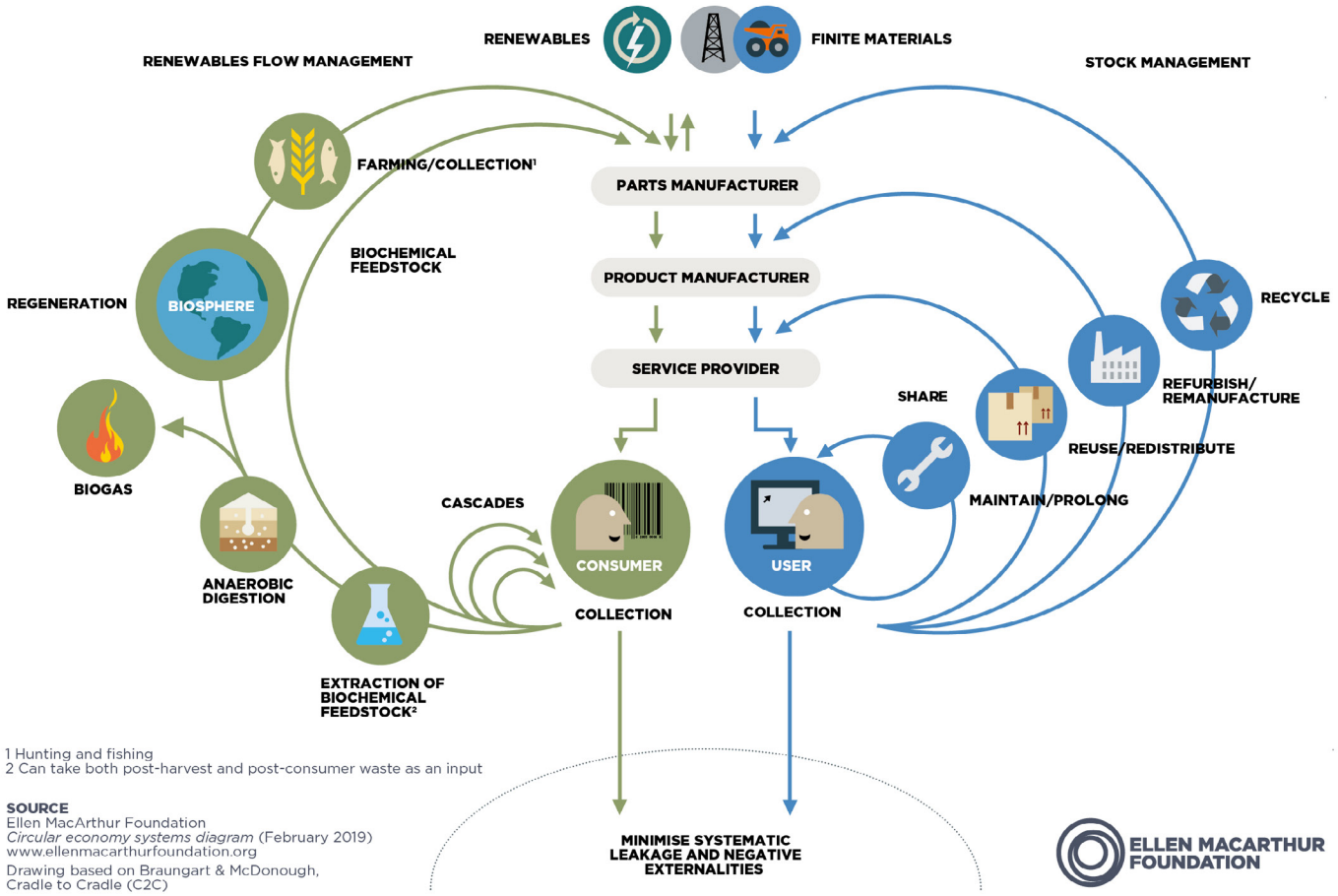
The **circular economy** is a model to keep materials and products in the economy while optimally retaining their value. Unlike a linear economy, in which raw materials from products ultimately disappear out of the material cycle, the circular economy is aimed at **retaining the value** of materials and products. In a circular economy, products (or the materials they contain) are specifically designed for constant reuse, for example through repair, sale at high second-hand value, or upgrade. Once this is no longer possible, the products are recycled as much as possible and, if necessary, broken down into their constituent materials. In this way, any extracted raw materials will remain present in the economy and the material cycle is closed, like in a natural ecosystem.

The butterfly diagram of the circular economy below (developed by the Ellen MacArthur Foundation) visualizes the biological and technical cycles of the circular economy:



Source: https://vlaanderen-circulair.be/nl/kennis





Source: https://ellenmacarthurfoundation.org/circular-economy-diagram

1.2.2 – Why is a circular economy important?

Resource scarcity
It is becoming increasingly difficult to extract raw materials and find new sources. As a result, excavation is going deeper and further, and this is having a huge **impact on the environment**, while also further driving up the **prices** of scarce resources. The European Commission keeps a list of critical raw materials that are economically important to us but are becoming difficult to source.

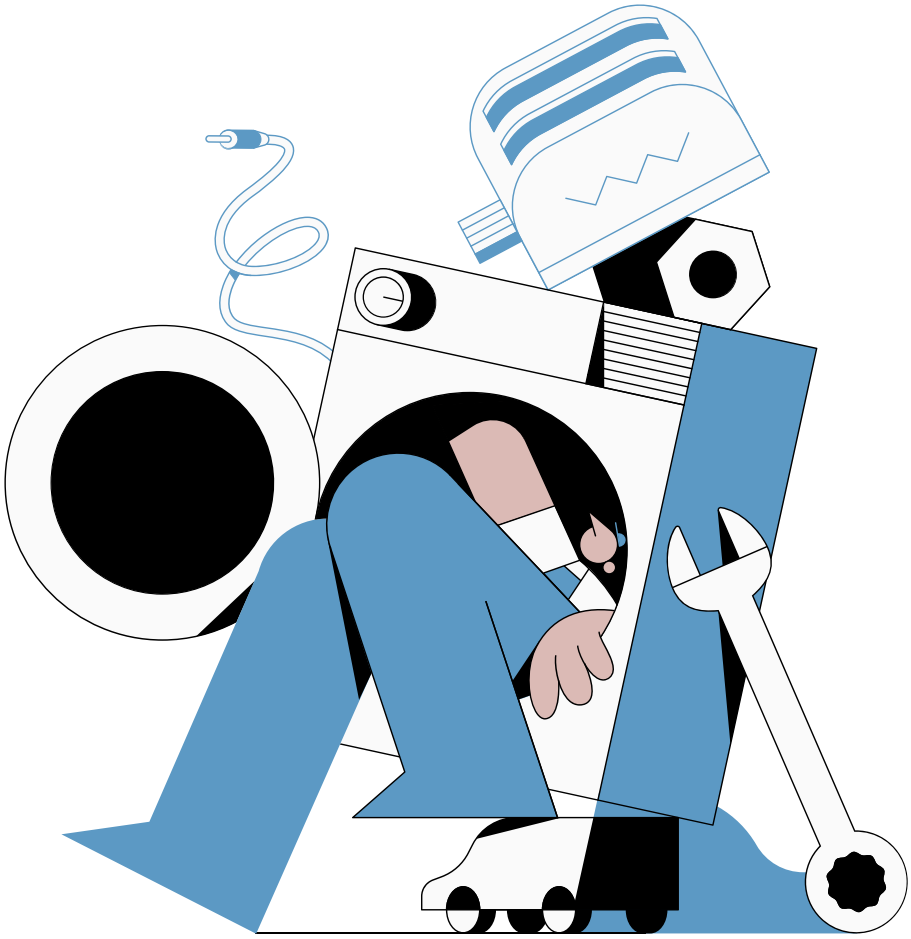
Climate disruption
Extracting and transporting raw materials and turning them into products (and after use, often recycling or incinerating them) costs a lot of energy, and therefore produces high **greenhouse gas emissions**.

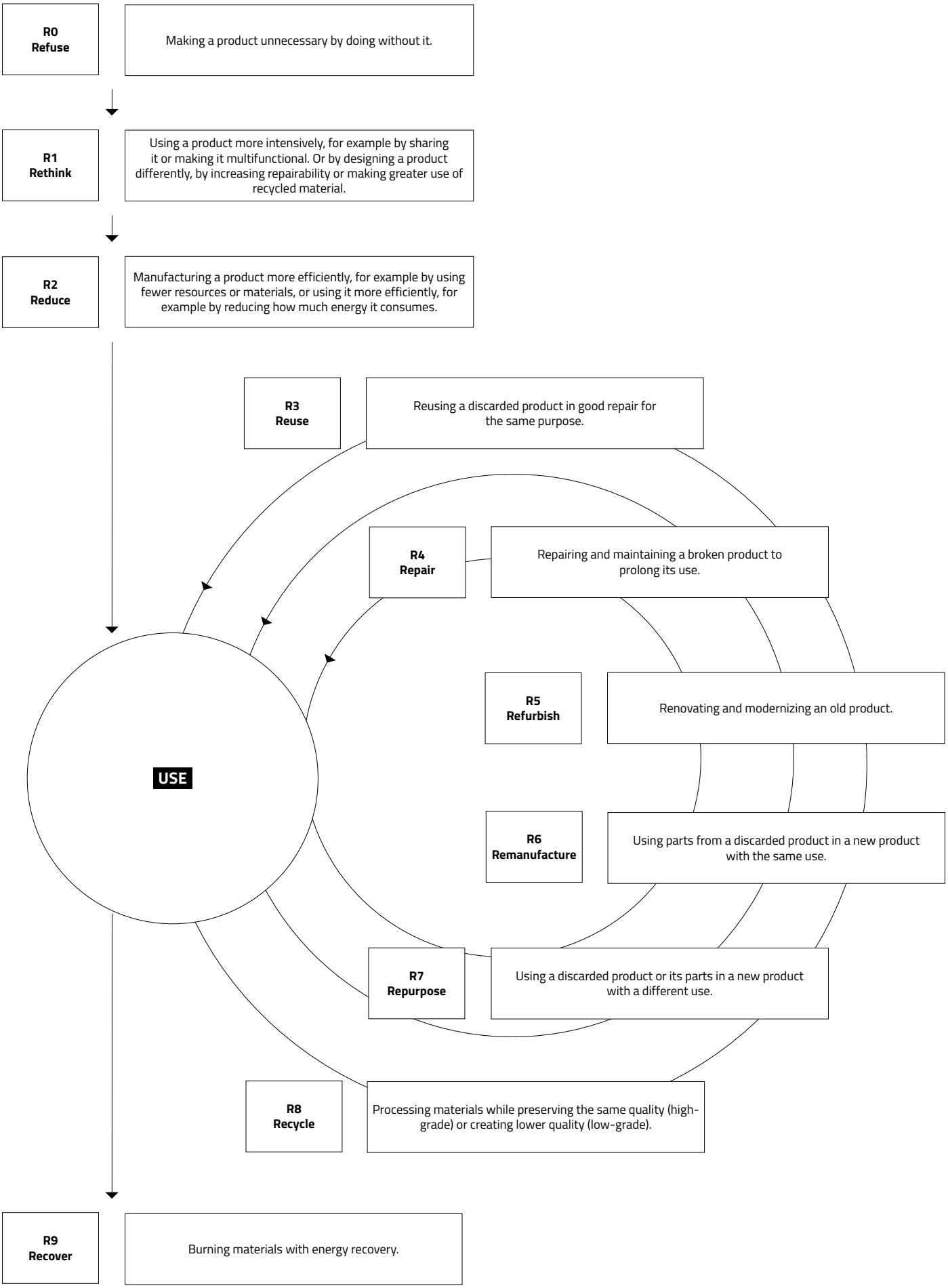
Economic and social benefits
The transition to a circular economy in the EU would lead to an estimated growth in GDP of 0.5% by 2030 with 700,000 new jobs. This would create many new opportunities for innovative and creative craftspeople, creators, repairers, sorters, assemblers, repurposing staff, recyclers, carriers, designers, platform developers etc.

1.2.3 – How do you bring about a circular economy?

Changing the way we deal with products and materials is an important step in the transition from a linear to a circular economy. The 'R strategies' show how – and in what order of priority – products and materials should be treated to ensure that the raw materials in them retain as much of their value as possible, waste materials are reduced to a minimum and environmental pollution and greenhouse gas emissions are kept as low as possible.

First and foremost, products should be designed, manufactured and consumed in a manner that optimally extends their lifespan, makes them easy to repair and reuse and reduces the volume of waste materials. Secondly, reuse should be stimulated, for example by selling products second-hand and, if necessary, repairing them. Thirdly, any waste materials that are nevertheless generated should be recycled as much as possible and not be allowed to disappear out of the material cycle. If that is impossible, the waste products that are released should be applied in some useful way, for example for energy recovery or as a source of energy.





Based on https://www.rvo.nl/onderwerpen/r-ladder

1.3 – Repairing electrical and electronic devices

1.3.1 – Production, consumption and waste flow of electrical and electronic devices

Electrical devices are simple devices that run on electricity and can often be switched on using a power switch, such as blenders, heaters or simple coffee machines. They usually have a single function that is operated exclusively by electrical components such as a power supply, a cable and a motor.

Electronic devices are controllable devices that often have multiple functions, for example smartphones or coffee machines with settings for one or more cups. They are operated (at least partially) by electronic components such as a circuit board, a diode and a capacitor.

It is hard to imagine our lives without electrical and electronic devices. Across the world, people exchange information via their computers, make appointments via their smartphones and prepare food using blenders, ovens and toasters. Electrical and electronic devices make our lives a lot easier.

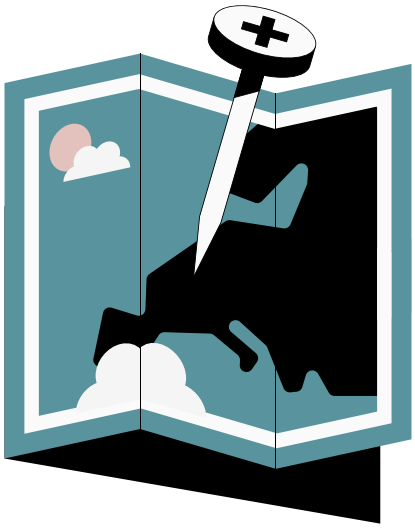
But producing these devices requires intensive mining of often rare, non-renewable resources, such as gold for smartphones. This kind of extraction is harmful both to the environment and to the quality of life of the frequently exploited people who mine the raw materials in unsafe, unhealthy conditions. These resources are usually located in the global South, where foreign private mining companies take advantage of low wages and inadequate government regulation of the mining industry. These mining companies disrupt local communities by acquiring concessions without the local population's consent, purchasing land at derisory prices and extracting raw materials with technologies that involve the use of toxic chemicals such as cyanide, which then enter the groundwater and pollute local ecosystems, agriculture and drinking water. Local resistance to these practices often leads to bloody mining conflicts and human rights violations.

Similarly, the production process from raw material to device has a negative impact on living environments and communities. Highly toxic chemicals are released during the production of complex electrical and electronical devices such as smartphones and laptops; these chemicals are often harmful for workers and end up in the groundwater and in drinking water. Moreover, producing devices often requires more energy than using them. Many newly manufactured devices therefore already have a considerable carbon footprint even before they are switched on for the first time by a consumer. And if you add to this the greenhouse gas emissions that result from transporting materials and devices across the globe, it is clear that every newly produced device has a strikingly negative impact on our climate.

VIDEO

The documentaries 'Death By Design' and 'The E-waste Tragedy' show the often dramatic impact that the production process and waste flow of electrical and electronic devices have on our living environment and communities.

After an intensive extraction and production process, many electrical and electronic devices end up being used only briefly. Electrical and electronic devices today stop working 20% faster than 20 years ago. Broken devices are usually not repaired by the producer once the warranty has expired, and the lifespan of the product then depends on its repairability and the consumer's decisions. Moreover, producers of electrical and electronic devices often make choices that actually reduce the lifespan of devices or make them harder to repair. They frequently do this to save costs or because product repairability and a long lifespan do not interest them. Producers may choose the cheapest design, without screws, or cheap parts that are likely to break more quickly. And they sometimes use different parts for every new model and choose to discontinue older parts, fail to guarantee that devices can be updated, etc. Some producers simply want to sell as many devices as possible and build software or malfunctions into their products by design to ensure that they will break faster. We call this 'planned obsolescence'. For example, there are printer manufacturers who programme their printers to show an insoluble error message after a certain period or a set number of prints.



After use, the raw materials in broken, worn or dated electrical and electronic devices usually do not end up in the material cycle because households typically keep old devices indefinitely in a drawer. Devices in households that are no longer used and whose raw materials are lost to the circular circuit are called 'dormant devices'. But even if they are collected, the materials from electrical and electronic devices are difficult and expensive to recover for recycling, as most devices contain very small quantities of many different raw materials that are not easy to separate from each other.

In the current linear economy, electrical and electronic devices make up the largest waste stream in the EU. Worldwide, this waste stream is growing three times faster than the world's population; it is the fastest growing waste stream. Less than 40% of the waste materials from these devices is currently being recycled in the EU, and only 17.4% worldwide. Devices that are not recycled are frequently exported illegally to countries in Africa and Asia where the often-toxic waste is dumped in landfill sites and burned. The chemicals released in the process constitute a health hazard for local residents, damage the environment and contribute to climate disruption through the accompanying high greenhouse gas emissions.

While the world population produces 7.3 kgs of e-waste per person annually, Europe produces 16.2 kgs of e-waste per person annually, with Belgium in sixth place in Europe. E-waste is the fastest growing waste stream, encompassing about 53,600,000 tonnes of electronic waste every year.

The production and waste stream of electrical and electronic devices is responsible not only for the exhaustion of raw materials, high greenhouse gas emissions and environmental pollution (Planet); they are also harming people's health and ways of life (People).

FURTHER READING

Read more about the various strategies manufacturers use to plan obsolescence, and why they do this, at https://www.stopobsolescence.org/.

Consumers choose to purchase, use and discard electrical and electronic devices, and individuals are consequently not powerless. You can decide not to buy the latest earbuds (REFUSE), to share a washing machine with your neighbours (SHARE) or bring your old smartphone to a recycling depot (RECYCLE). Often the best way to keep utilizing the raw materials in a device and minimize its negative impact on human beings and the planet is to use it for as long as possible and repair it if it breaks (REPAIR). It is important to realize that, in some cases, there is a tipping point where the impact of continuing to use the device will be more negative than that of buying a new one. The production process of a new device can be traded off against the energy consumption of an old product, for example when a consumer would be better off buying a new washing machine that consumes much less energy and water than an older machine.

You can help reduce the extraction of valuable and rare resources and ensure that future generations will also be able to use them by repairing broken electrical and electronic devices rather than buying new ones. Keeping electrical and electronic devices—and the raw materials from which they are made—in use for as long as possible means getting the most out of the intensive extraction, production and transport they represent. It also limits new extraction, production and disposal. Using electrical and electronic devices for as long as possible and replacing them with new devices as little as possible means avoiding the greenhouse gas emissions that are required to produce a new device, thus limiting the contribution to climate disruption. Repairing a device yourself also means acquiring valuable skills, insight into the production of consumer goods and an appreciation of craftsmanship. And having a device repaired creates work for local repairers and stimulates a sense of community through local social repair initiatives such as Repair Cafés.

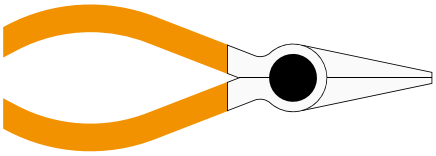
Repair Cafés
Repair Cafés are free meetings where people come to repair broken products together, from clothes and electrical devices to furniture, bicycles, computers, etc. Participants bring broken products with them and repair them under the assistance and guidance of expert volunteers. Repair Cafés teach or reteach people how to repair things and help reduce waste.

Repair Cafés are held in many cities and towns. It is very likely that the Repair Café in your area would be interested in organizing something with your school. Students, parents and teachers can get to know the Repair Café together and repair or learn how to repair their broken products. This could be a way for the Repair Café to reach a new audience and maybe recruit a few new volunteers. And who knows, it might inspire your students to organize a Repair Café themselves. You can find the Repair Cafés in your area on this map: https://mapping.sharepair.org/en

Is there no Repair Café in your neighbourhood? Then organize one yourself! Read about how to do this here.

Unfortunately, manufacturers of electrical and electronic devices in the current, linear economy normally do not make it easy for consumers to repair their broken products. A lot of electrical and electronic devices cannot be easily disassembled, official repair manuals are very rare and spare parts are expensive or difficult to source.

Other than choosing to buy products with a long lifespan that are repairable, there is little you can do on your own to end this negligence on the part of the sector. But in addition to consuming consciously, you can exert pressure on policymakers and manufacturers to implement a circular economic model that discourages planned obsolescence and facilitates and encourages repair. One way of doing this is by signing the #Righttorepair manifesto.



Repairscore
To stimulate manufactures to make electrical and electronic devices more easily repairable and to encourage consumers to make conscious choices, policymakers could adopt a compulsory 'repair score' for electrical and electronic devices, a score that ranks their repairability. Similar systems have already been introduced in Belgium for energy efficiency (House Energy Rating) and for the nutritional value of food (Nutri-Score) (A, B, etc).

Such a score system could take its cue from the 'Indice de réparabilité' or repair index that was introduced in France in 2021. This index is based on 5 easily measurable and verifiable criteria: repair information, ease of disassembly, availability of replacement parts, price ratio between reserve components and a newly purchased product, and product-specific criteria.

https://repair.eu/news/the-french-repair-index-challenges-and-opportunities/
https://www.indicereparabilite.fr/

Urban mining
Instead of extracting new raw materials through mining, it is also possible to 'mine' raw materials and parts that have been discarded after use. This is called urban mining. Discarded electrical and electronic devices contain many precious metals and parts that can be used to repair other products. By recovering these raw materials and parts, we return them to the material cycle so that they can be used to make new products without having to extract new raw materials. Whether or not a resource can be recovered through urban mining depends on a number of factors, such as the availability of technologies and materials to be harvested and a trade-off between the costs of the often-complex recovery procedure and of mining.

1.3.3 – Repairing devices yourself or having them repaired

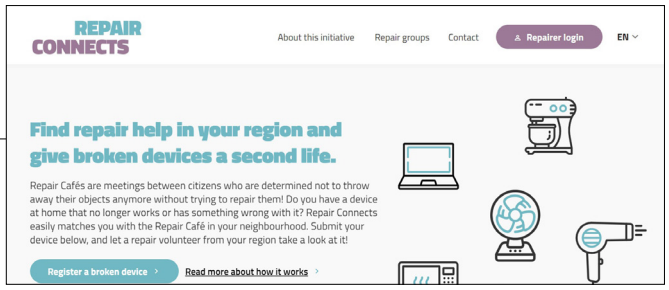
By repairing electrical and electronic devices, you can help prevent the exhaustion of raw materials, reduce global environmental pollution and climate disruption, improve people's quality of life and acquire valuable skills yourself. A recent study by Vito and other academic studies have shown that the costs for consumers who are more likely to have electrical and electronic devices repaired and less likely to replace them with new electrical and electronic devices are lower than for consumers who are more likely to replace broken devices with new ones.

It can be difficult to repair a device or to have it repaired, and this is why Sharepair has developed a number of tools:

RepairConnects
RepairConnects is a broad platform that supports Repair Cafés and involves owners of broken devices in the repair process. People can use RepairConnects to register broken products before they attend a Repair Café to help make their visit even smoother. RepairConnects also has a facility to match owners of broken devices with repairers.

Repairers can log the devices they have repaired in RepairConnects, indicating the methods they used. This information can later be accessed by other repairers to find repair solutions. This data can also be used to measure the number of devices repaired and the impact – the reduction of waste from electrical and electronic devices realized, impact on climate, etc. The Right to Repair movement uses data on the most common problems, missing spare parts, etc. to influence policy and move repair higher up the priority list.

https://www.repairconnects.org/en



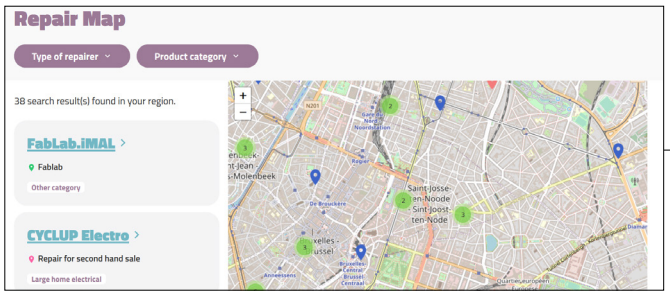
Guidance tool
The guidance tool advises owners of a broken device on how to repair it or have it repaired. The tool offers general information about repair options, such as your rights as a consumer within the warranty period, repairing devices yourself, repairing it in a Repair Café or having it repaired by a professional repairer, 3D printing for repair, etc.

If you want to repair the product yourself, the guidance tool also offers concrete tips for diagnosis and repair of a number of product categories such as blenders, toasters, laptops, etc.

https://www.guidance.sharepair.org/en

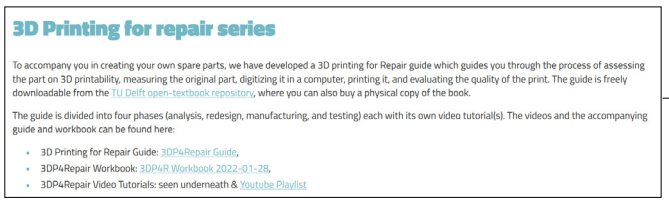
Repair Maps
Repair Cafés are not the only place where devices can be repaired. Repair Maps is an inventory of repair actors across the entire project region, ranging from professionals and Repair Cafés to fab labs and recycling centres. The goal is to offer a transregional overview of everyone who can help you with specific problems in your area.

https://mapping.sharepair.org/en



3D print parts
If you cannot find a new or recovered spare part, then maybe 3D printing could be a solution! This platform provides useful background information (when 3D printing is an option, what things you need to keep in mind, where you can have it done, etc) and directs you to 3D designs to get started yourself.

https://www.sharepair.org/sharepair-3d-printing



DIDACTIC BACKGROUND INFORMATION

This chapter introduces you to the underlying vision of Education for Sustainable Development and the didactic principles on which the teaching pack is built.

The second part familiarizes you with the basic didactic concepts of the teaching material. This helps you understand its modular structure and the learning process behind the steps required to engage students.

2.1 – Education for Sustainable Development (ESD)

2.1.1 – The complexity of social problems

This educational pack is based on a vision of Education for Sustainable Development and on the ensuing principles. Discussing sustainable development (see the first part above) means addressing **complex** issues of sustainability and social problems. Climate change, the waste mountain – these are all multifaceted issues that have both **local and global components** that involve many actors.

There are as yet no clear, ready-made solutions for or answers to these challenges. Moreover, the waste problem, like other social challenges, is highly **dynamic**. Our knowledge of the issue is constantly expanding or changing. Any possible answers will therefore be subject to frequent revision.

Finally, there is seldom consensus about the values and norms that guide sustainability. The great social challenges of our time are called **wicked problems** for a reason. The values and norms that these problems touch on appear to be in constant conflict, and there is no consensus. For example, a solution that involves reducing the extraction of raw materials would benefit the ecology, but would conflict with the value we attach to our way of life.

2.1.2 – A rich learning context

Precisely because social challenges are complex, thinking about them can aid the development of children and young people. Because they are not clear-cut and need new, creative answers, they constitute a **rich, interesting learning context**.

Climate change, the swelling waste stream, the pressures on biodiversity and similar issues are all **authentic challenges** that intersect the daily lives of students. They invite students to engage in further **inquiry**, which allows them to use their knowledge and skills purposefully and practise them. In addition, social issues invite students to **interact and exchange perspectives**. Many aspects and possible solutions give rise to multiple and sometimes conflicting opinions, ideologies and values. This interaction with a diversity of perspectives can enrich and widen students' outlook and knowledge. Social issues can thus become a source of common inquiry and a learning process in which **ideas for change** can germinate.

This inquiry and learning process are particularly suited for the classroom and/or the school. A school that focuses on Education for Sustainable Development can become a **training ground** that offers a safe space where students gain experience with social issues. It gives them the opportunity to practise being active citizens of the world and make choices. They learn to think about what a sustainable society means to them and what choices it entails for them.

2.1.3 – Learning by action-oriented thinking

Developing this **capacity to choose** requires more than just knowledge. It is essential to be knowledgeable about the great and small aspects of any social issue, but in the context of Education for Sustainable Development, **knowledge building** is not just a goal. Knowledge is not something you either have or do not have, but it is something **active and dynamic** that you use and build up by using it.

Making choices concerning a social issue begins with brainwork: inquiring into causes and effects, comparing different views, coming up with ideas or criteria for action, critically examining proposed solutions, focusing on specific aspects of a problem, etc. This is only a small sample of the many different critical thinking skills or **thinking processes** that you can deploy purposefully.

Action-oriented thinking is characterized precisely by this **purposefulness**. Whenever students are confronted with some social challenge, this could be an opportunity for purposeful thinking to propose possible change or action. This could entail either direct or indirect change, for example a new perspective, a better understanding of the subject, or external action that leads to direct or indirect change.

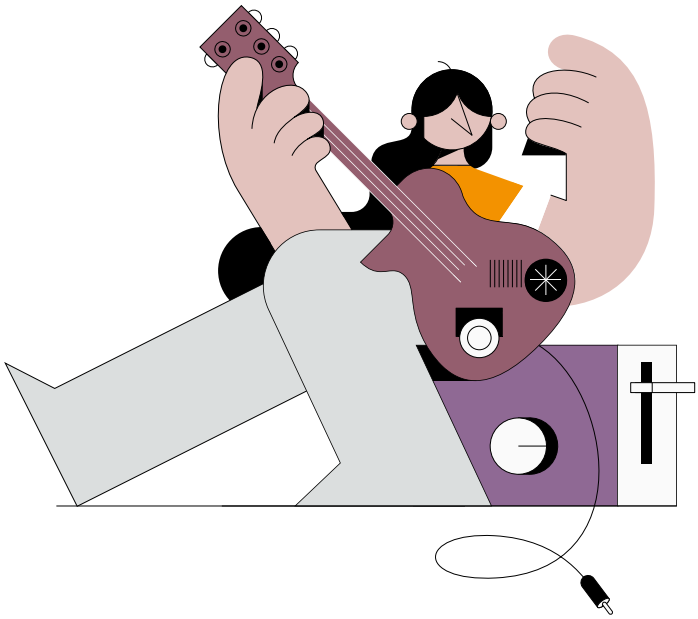
Students who have the opportunity to deal with social issues at school develop **self-confidence** in their own ability to make choices and help shape society.

In the context of Education for Sustainable Development, students need a learning environment that focuses not only on knowledge, but also specifically on critical thinking skills, dialogue and cooperation. These elements are crucial to build students' awareness and their transformative capacity, and they form the didactic principles for this educational pack.

2.2 – Working with this teaching pack

The teaching pack comprises **five modules** that can be used to teach a course of at least five class hours. You can also use the modules separately for a shorter course, or in a different order if that is more appropriate to the teaching context and the students' assessed attention spans. For example, you may prefer to have the students engage in an action-oriented, tangible activity first to stimulate them, and reserve the in-depth exploration of or inquiry into the problem for later.

Every module contains aids for preparing the lesson, including critical thinking questions, sample answers, appendices (maps, images, articles, videos etc.), detailed alternative options and tips. Every module has a different focus and different learning goals, which all have as their common goal that **students understand how their choices regarding the production, consumption and repair of electrical and electronic devices can contribute to a more circular economy**.

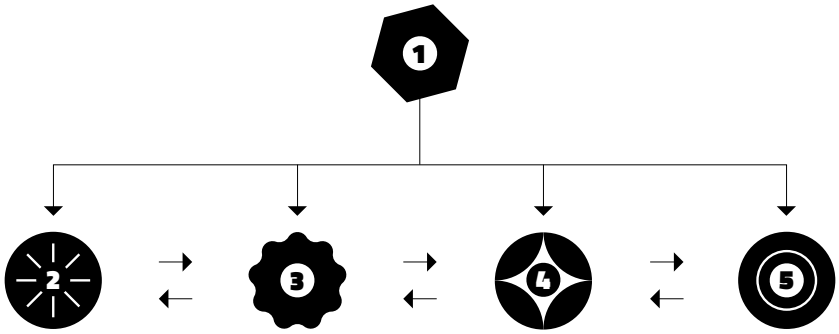


TIP MODULE 1 MODULE 2 MODULE 3 MODULE 4 MODULE 5

This icon in the modules marks a cross-reference to another module. You can use these references to build your own coherent course with the modules in a different order.

TIP

If you do not have enough time to go through all the modules in your own classes, consider asking a colleague from a different discipline to take one or more modules in theirs. A Geography teacher could take modules 1 and 2 and an Economics teacher modules 3 and 4.



MODULE 1: EXPLORATORY
Stimulus and awareness

The **first** module is intended to **stimulate** the students and raise **awareness** about the production, consumption and repairability of electrical and electronic devices. The students become aware of the many electrical and electronic devices they and people close to them use. They are introduced to the model of the circular economy and the R strategies as applied to electrical and electronic devices.

MODULE 2: EXPLORATORY
Perspectives, opinions and emotions

In the **second** module, the students explore **perspectives, opinions and emotions** concerning the production, consumption and repair of electrical and electronic devices and examine the impact of their own choices.

MODULE 3: INVESTIGATIVE
Research skills

The **third** module focuses on formulating research questions and conducting an online market survey. The students have to come up with and inventory as many questions as possible about repair options and the lifespan of electrical and electronic devices, test these questions against criteria for a good research question and classify them accordingly, and then try to answer their research question.

MODULE 4: INVESTIGATIVE
Underlying causes and leverage points

In the **fourth** module, the students process the results of their own research (module 3), or alternatively of a popular-science study that is provided to them, to find the underlying causes and reflect on where they can and wish to make an impact themselves.

MODULE 5: ACTION-ORIENTED
Possible actions

In the **fifth** module, the students explore their motivation to take action with regard to the production, consumption and repair of electrical and electronic devices. They are asked to look at examples and devise criteria, and then propose ideas and possibilities for concrete action, and commit to elaborating these and putting them into practice.

2.3 – Education for Sustainable Development in this teaching pack

The production, consumption and waste stream of electrical and electronic devices is a complex global issue that affects almost everyone. The complexity of the issue lies in the many dimensions that the full chain comprises: the extraction of ever-scarcer raw materials, the accompanying pressure on ecosystems and social conditions and the ever-increasing production, consumption and waste stream. Almost every young person today owns or uses a smartphone or some other electrical or electronic device, and there can be no doubt that the issue directly involves each one of them. What you are doing as a teacher, therefore, is address an issue that every young person recognizes and feels involved with somehow. This sense of **involvement** and the **complexity** of the issue mean you can create an interesting and challenging learning context. The modules therefore contain critical thinking questions, propositions and relevant media contributions.

Rethinking the complex chain from extraction to disposal through the model of the circular economy, and encouraging young people to consciously choose to repair or take other sustainable actions with regard to electrical or electronic devices, requires a specific approach. It is not enough to just convey existing knowledge about the issue.

Nearly every module in the teaching pack focuses on **doing, thinking and dialogue**. In the first module, for example, students are invited to disassemble a device to experience first-hand the repairability – or lack thereof – of products (this is an alternative option, because it may not always be possible to do this in the classroom). The students then compare strategies for dealing with electrical and electronic devices and exchange views about them.

Interaction with other perspectives, for instance the perspectives of other students or fictional characters, helps students confront the knowledge they have about electrical and electronic devices with other insights or ideas. In the second module, for example, they have to defend a proposition and listen to opposing arguments; after all, there are conflicting opinions about many aspects of repairable or non-repairable electrical and electronic devices. Students will also focus on the consequences of adopting certain views, for instance by charting intended and unintended and expected and unexpected consequences. All these activities give students the opportunity to use their knowledge and enrich or expand it.

The various modules also challenge students by posing **critical thinking questions** about the subject. This helps them not only to expand their insight, but also practice the critical thinking skills that can help them to make **conscious choices** about sustainability questions. Thus in the third module, the students are asked to formulate questions about the repairability of electrical and electronic devices themselves, and to conduct a market survey to find the answers. A follow-up critical thinking exercise concerning the underlying causes of the results of the survey in the fourth module provides the opportunity to discover l**everage points for change**.

Critical thinking exercises, dialogue with fellow students or interaction with other perspectives can result in students making the conscious choice to repair electrical and electronic devices. To give the students **self-confidence** with regard to their own impact on society, they are encouraged in the fifth module to think of specific action that can contribute directly or indirectly to repair of electrical and electronic devices. This gives them agency and helps them understand that their choices can make a difference.

Finally, making a conscious choice for repair also depends on personal characteristics, values, ideology, etc. The teaching pack includes opportunities to address these aspects with regard to the students and reflect on them.

2.4 – Visual support

Modules 1 and 2 contain stock photos that can be used during class. If you prefer to use alternative images, you can find high-resolution **stock photos** for free on online image archives such as www.pixabay.com or www.pexels.com.

2.5 – EAL students

This teaching pack contains specific vocabulary relating to electrical and electronic devices and the circular economy. New terminology is often introduced by instructions, critical thinking questions, articles and videos. In addition, the pack contains group assignments. We have a few tips for working with EAL students and/or students with weak language skills:

TIP 1

Before class, print a word wall with images and display it in the classroom. Go over key words with the students before you start an assignment or read an article, and make sure everyone understands what these words mean.

TIP 2

Ask the students to familiarize themselves with a text or video in small groups or beforehand at home. Form heterogenous groups or pairs to ensure that students with strong language skills read the text or help the other students.

TIP 3

Create visual references for class or group assignments on the blackboard using drawings, sketches, mind maps, pictograms etc. Write down arguments, ideas or key terms on the blackboard so that all students can understand the assignment.

TIP 4

Help students to give their own opinion or question each other's views by giving them a few examples of how to start a sentence.

- In my opinion, ...
- I think that ...
- This makes me feel ..., because ...
- I agree/don't agree, because ...
- What do you think?
- Do you agree? Why/why not?

TIP 5

Help students with their writing assignments by giving them a few examples of how to start a sentence, for ...

... writing a report:

- This is about ... I knew ...
- I have learned that ...
- I also learned that ...
- In addition, I found out that ...
- Lastly, I learned that ...

... comparing similarities and differences:

- The ... is just as ... as ...
- The ... is similar to ..., because ...
- The ... is not the same, because ...
- The ... and the ... differ from each other, because ...
- Lastly, they are both ...
- Although a ... and a ... are different, there are similarities. For example, they both ...

... giving your opinion:

- In my opinion, ... because
- I think that ... , because ...
- My view on ... is that ...
- I have a number of arguments to back up my opinion. First, ... Second, ... Third, ...
- I agree with ..., because ...
- I don't agree with ..., because ...

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This teaching pack was created in the context of the European Sharepair project and was commissioned by the City of Leuven, Apeldoorn and Roeselare, in cooperation with Repair&Share and Maakbaar Leuven with the support of the Flemish government.

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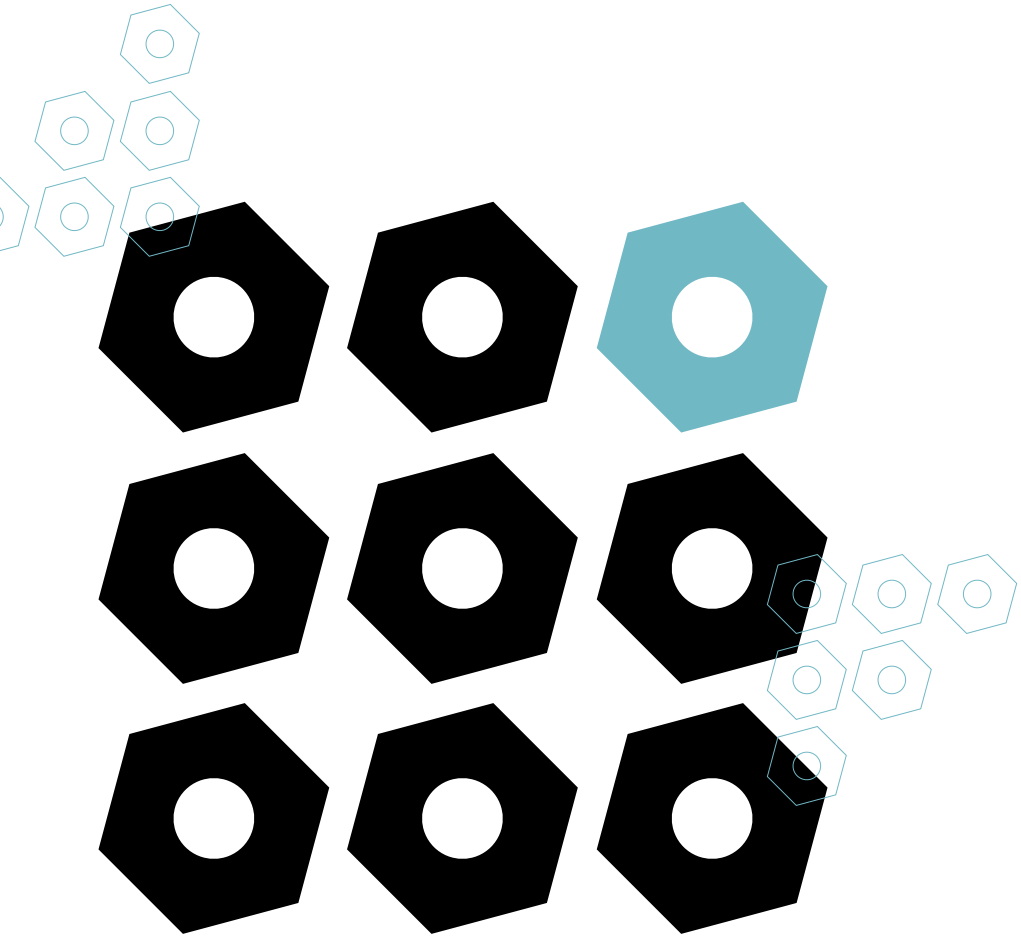
STIMULUS AND AWARENESS

TARGET AUDIENCE 14 to 18 years



MAKE IT WORK! MODULE 1

SHORT SUMMARY During this lesson, students are stimulated to think about design choices for electrical and electronic devices, and they explore the model of the circular economy and the R strategies. They explore why repairing electrical and electronic devices is an important step towards creating a circular economy and how their choices can contribute to this.

Interreg North-West Europe SHAREPAIR
djapo
België partner in ontwikkeling
Vlaanderen verbeelding werkt

STIMULUS AND AWARENESS

DURATION ▸ 50 minutes

LEARNING OUTCOMES

- Students are aware of the impact of design choices on the repairability of electrical and electronic devices.
- Students have insight into the model of the circular economy with regard to electrical and electronic devices.
- Students have insight into the model of the R strategies with regard to electrical and electronic devices.
- Students are able to use the R strategies to explore why repair is a sensible option for electrical and electronic devices.
- Students are aware that repairing electrical and electronic devices is important for the creation of a circular economy.
- Students are aware of the value of 'dormant' electrical and electronic devices in their homes.
- Students understand how their choices with regard to the production, consumption and repair of electrical and electronic devices can contribute to a more circular economy.

MATERIALS REQUIRED

- A whiteboard or flip chart
- A number of broken or faulty electrical and electronic devices, for instance a broken bicycle light, a faulty hairdryer, a smartphone with a broken screen, a jammed toaster or printer, etc.
- Tools to disassemble the broken devices, for example screwdrivers
- Stock photo of a person on an e-waste landfill site in Accra, the capital of Ghana (appendix 1)
- Visual linear vs. circular economy (appendix 2)
- Blank diagram of the R strategies (appendix 3)
- Cards with the R numbers (appendix 4)
- Cards with the R strategies (appendix 4)
- Cards with explanations of the R strategies (appendix 4)
- Cards with student-consumers' choices that reflect the R strategies (appendix 4)

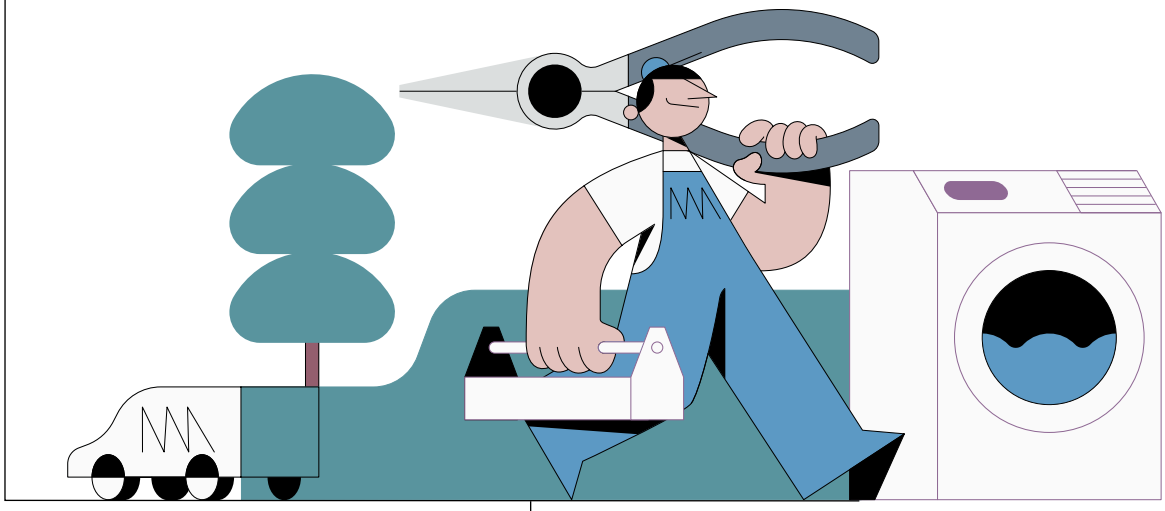
TO DO BEFOREHAND

- Read the Background Information document attentively. This text gives you the what, why and how of the subject and the didactic knowledge and insights you need to work with this module.
- Choose those elements from the module that suit your students best and are most compatible with previous and planned lessons.
- Consider asking the students in advance to bring a number of broken or faulty devices with them to class. If you do, give them a note to bring home for their parents to consent to the disassembling of the devices during class, warning them that the devices may not actually be fixed or may be returned to them in worse state.
- Print the cards with the R strategies (appendix 4) in colour and cut them out.
- Draw or attach the blank diagram of the R strategies (appendix 3) on the board or on a flip chart.

LESSON PLAN

1 – STIMULUS

At the start of the lesson, make the students aware of the many electrical and electronic devices that they and people around them use, for example smartphones, earbuds, smartwatches, laptops, tablets, keyboards, printers, game consoles, e-readers, bicycle lights, e-scooters, coffee machines, hairdryers, blenders, toasters, dishwashers, kettles, washing machines, clock radios, shavers, electric toothbrushes, etc.



Extension: the design phase

The most effective way to stimulate your students is to have them disassemble and, if possible, repair a device themselves.

Consider bringing in an expert for the technical part of the lesson, for example by inviting a repairer through the RepairConnects platform.

Read on for a number of ways in which you can visualize disassembling and repairing products in the classroom.

First experience

Take a closer look together with the students at a few broken or faulty electrical and electronic devices, for example a broken bicycle light, a faulty hairdryer, a smartphone with a broken screen, a jammed toaster or printer, etc. Ask the students to disassemble the devices and find out what needs to be done to repair them. Time the assignment at fifteen minutes and then ask for their first findings and experiences.

- What steps do you have to go through to repair the device?
- Was it necessary to disassemble the device or not?
- Did you manage to disassemble the device?
- If so, was it difficult to disassemble the device?
- If not, what made it difficult to disassemble the device?
- Were you able to repair the device? Why or why not?
- Why do you think devices are so difficult to disassemble and repair?

Reverse engineering

If you have at least 25 minutes of additional time, you could ask the students to disassemble the devices to find out how they work.

Make sure you have enough screwdrivers, pliers and other repair tools, and then divide the students into pairs. One student in each pair tries to disassemble the device step by step, while the other tries to create a schematic representation of how the device works. They could do this by drawing a diagram on a flip chart, taking pictures and making a digital poster with the photos, making a video, etc. You could ask the students to chart a specific flow in certain devices, for example the flow of water in a coffee machine, of air in a vacuum cleaner, of sound in a CD player, of electricity in a blender, etc.

The pairs then present their diagram, drawing, poster or video to the class. You could also turn this into a quiz.

- What do you think this part does?
- How does ... cause ...?

The design phase of smartphones

If you do not have broken devices in the classroom or prefer not to have students work with devices during class, you could ask the students to look online, on YouTube for example, for 'how to' videos or tutorials on disassembling their own smartphone, and ask them to report back to the class. Most smartphones are glued shut and are difficult or even impossible to disassemble. Ask for the students' first findings and experiences.

- How long does it take on average to disassemble a smartphone according to the videos?
- What brands have posted official 'how to' videos online?
- Are there big differences between the brands? If so, what differences?

- Repair time
- Complexity
- Risks
- Cost
- Availability of repair tools

VIDEO

Or you could show the class a 'how to' video on disassembling an iPhone yourself, and ask students to compare it with a similar video for a type of smartphone that is easier to disassemble. For example, compare this unofficial video on how to repair an iPhone (26'11") with this official video by Fairphone (7'53"). Fairphone shows in this video how to disassemble its device and replace parts. Their smartphones have been designed to allow complete disassembly and replacement of almost all parts.

Explain that during the **design phase** of products, manufacturers of electrical and electronic devices often choose to glue them shut. This makes it more difficult for consumers to disassemble the device and replace parts, and therefore to repair broken or faulty devices. This stimulates consumers to purchase a new product, which drives up sales for the manufacturers. For example, if the battery of a smartphone is no longer charging but the smartphone is otherwise still working properly, the consumer will consider just replacing the battery. But if this is impossible or the price of a new battery is almost as high as the price of a new smartphone, the consumer is likely to choose to buy a whole new phone.

- How does this make you feel?
- Do you think there is anything you can do about this?

Then briefly ask students to share their more general experiences with electrical and electronic devices. Choose the questions you want to discuss and keep the conversation focussed.

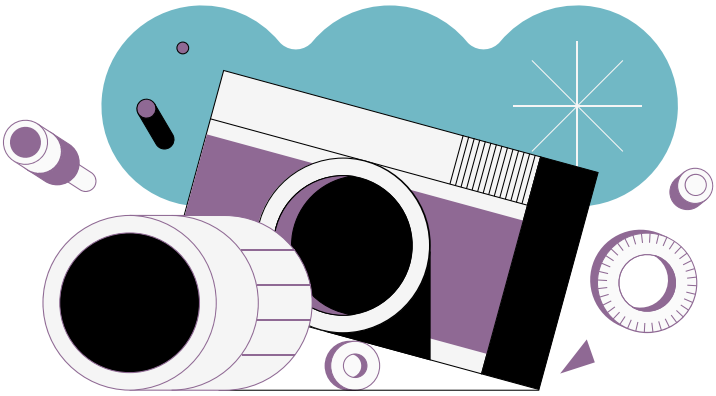
- What electrical and electronic devices do you have at home? What kinds of devices are they?
- Do you share certain devices with others? Why or why not?
- What devices do you own? Which ones do you use often?
- How long have you been using this device? How long do you plan to use it? How long do you think this device will last?
- Do you have devices you no longer use? Why don't you use them anymore? What do you do with these devices?
- Are you or your parents thinking of buying a new device? Why or why not?

- The latest software doesn't work on my laptop.
- The battery in my tablet is not charging.
- The screen of my smartphone is broken.
- My smartphone camera is not as good as I would like it to be.
- The toaster at home doesn't get hot anymore.
- The coffee machine at home indicates that the water reservoir is empty even though it is full.
- My bicycle light is not working, even after I replaced the battery.

- How many times did your family buy a new device last month or last year? Why?
- Did you consider any options other than buying a new device? If so, what options? Why did you eventually decide to buy a new device?

TIP MODULE 3

Encourage the students to write any questions they have about the topic on a flip chart. Tell them you will discuss these questions during a future class.



2 – CORE

2.1 – Circular economy

Show the stock photo of a person on an e-waste landfill site in Accra, the capital of Ghana (appendix 1).

- Where do you think this is?
- Why do you think this person is doing this?
- What does this have to do with your use of electrical and electronic devices?
- How does this make you feel?

VIDEO

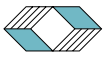
Consider showing the trailer of the documentary 'The E-Waste Tragedy' (2'45") or this BBC excerpt (4'06") about Agbogbloshie, a neighbourhood in Accra, Ghana's capital, which is home to one of the largest electronic waste dumps in the world. Large Western international companies dump their waste here, severely damaging the Ghanaian environment and worsening Ghanaian living conditions. Residents, including children, live there in degrading conditions among e-waste hoping to make more money than in agriculture.

Explain that electrical and electronic devices form the largest waste stream in the EU. Worldwide, it is growing three times faster than the world's population, making it the fastest growing waste stream. In the EU, less than 40% of the waste from these devices is being recycled. For the world as a whole, the percentage is only 17.4%. The waste that is not recycled is often illegally exported to African and Asian countries where this normally toxic waste is dumped and incinerated. The chemicals that are released in the process are a health hazard for local residents and for the environment, and accompanying high greenhouse gas emissions contribute to climate disruption.

- How does this make you feel?
- Can we agree that this is not a desirable situation?
- What would the desirable situation look like?

Explain that the circular economy is a model to continue using materials and products in the economy while optimally retaining their value. By contrast with a linear economy, where raw materials in products ultimately disappear out of the material cycle and are discarded, the circular economy tries to retain the value of materials and products. Products are designed in such a way that they (or the materials they contain) can be used again and again, for example by repairing them, selling them at high second-hand value or upgrading them. If this is not or no longer possible, the products are optimally recycled and, if necessary, broken down into their constituent materials. This keeps extracted raw materials in the economy and closes the material cycle, like in a natural ecosystem.

- Why do you think retaining the value of materials and products is so important?
- What could 'retaining the value of materials and products' mean? (intensive extraction, production, ...)
- What similarities do you see between an ecosystem and a closed material cycle? And are there any differences?



DIFFERENTIATION

Consider explaining that the production of electrical and electronic devices often requires intensive extraction of frequently rare, non-renewable resources, such as gold for the manufacture of smartphones. This is harmful both for the environment and for the quality of life of the often-exploited people who mine these raw materials in unsafe, unhealthy conditions. The deposits of the materials required are mainly located in countries in the global South, where foreign private mining companies abuse the low wages and the governments' failure to properly regulate mining. Mining companies are disrupting local communities by acquiring mining concessions without the local population's consent, buying land very cheaply, and using technologies that involve the use of toxic chemicals such as cyanide, which then enter the groundwater and pollute local ecosystems, agriculture and drinking water. Local resistance to these practices often leads to bloody mining conflicts and violations of human rights.

Also explain that the production process from raw material to device has a negative impact on living environments and communities. Highly toxic chemicals are released during the production of more complex electrical and electronic devices such as smartphones and laptops which can be harmful to workers and often end up in our groundwater and drinking water. Moreover, producing devices often requires more energy than using them. Many brand-new products will therefore have a considerable carbon footprint even before the consumer has switched them on for the first time. Add to this the greenhouse gas emissions that result from transporting materials and products to the other side of the world, and it is clear that every newly produced device has a strongly negative impact on the disruption of our climate.

VIDEO

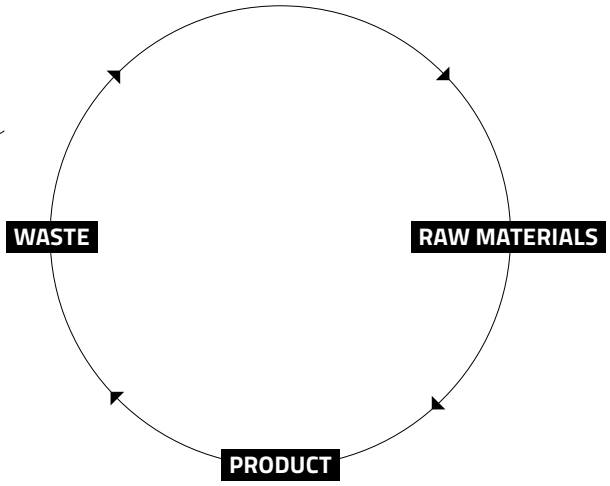
Consider showing the trailer of the documentary 'Death By Design' (1'46").

DIFFERENTIATION

Visualize the difference between the abstract concepts 'linear' and 'circular' by drawing an arrow and a circle or loop on the whiteboard and, together with the students, positioning concepts such as 'raw material', 'product' and 'waste' on them. You can also replace these concepts by more concrete examples such as 'cobalt', 'smartphone' and 'e-waste'.

- Can you position the words in the shape of an arrow?
- Which word comes first? Why?
- What happens after this arrow? Where does this arrow point?
- What word would you place at the end of the arrow?
- What do you think that means? Can you think of examples?
- Can these words also be placed to form a different shape? How?
- Can these words be positioned in the shape of a circle or a loop?
- What connections can you see between the words if we position them like this?
- What happens once the circle is complete?
- Is it possible to design this circle or loop in some different way? Why or why not?

Consider showing the illustration comparing the linear economy to the circular economy (appendix 2).



VIDEO

Consider showing this video by the Ellen MacArthur Foundation (3'48") explaining the circular economy and how society can re-think progress.

DIFFERENTIATION

If your students are able to work independently and you have more than 50 minutes, then you could decide not to do this part of the lesson collectively. Instead, consider 'flipping the classroom' by dividing the students into groups, each of which is asked to present one reason for a circular economy (see the Background Information document 1.3.1) to their fellow students.

2.2 – R strategies

Display the blank diagram of the R strategies (appendix 3) on the whiteboard or on a flip chart. Explain that if we want to transition from our current linear economy to a circular economy, we will have to deal with products and materials in a different way. The R strategies show how and in what order of priority we can deal with products and materials to ensure that the raw materials in the products retain maximum value, waste products are kept to a minimum and the environmental pollution and greenhouse gas emissions remain as low as possible. Ask the students to pin the R strategies to this diagram in the right sequence – from most to least circular solution.

Shuffle the cards with the R numbers, the R strategies, their explanation and the individual choices (appendix 4) and place them in a bowl in the middle of the classroom, or distribute them to the students to play quartets. Explain that they can form ten sets of four cards each.

- The green cards have the names of the R strategies.
- The purple cards illustrate the sequence of the R strategies according to their impact.
- The blue cards explain what the R strategies mean.
- The orange cards illustrate the R strategies by giving examples of choices by student-consumers.

Ask the students to draw a card each in turn and read it out loud, and then go around the classroom to ask each other questions to find their 'match'. Or play any other game that involves the students putting together a quartet with one card per colour, and ask them to pin these to the right place in the diagram. Ask in-depth questions while they do this and help the students to pin all the quartets to the right place the diagram.

TIP

Ask the students to read the examples on the orange cards first and ask whether they can relate to the choices that the characters on these cards make, how these choices make them feel, etc. Discuss which choices they think will make a greater contribution to a circular economy.

- Have you ever done anything like this yourself? How did that make you feel?
- Do you think it is a wise choice? Why or why not?
- What would you do or do differently yourself in this situation? Why?
- Do you think the climate impact of *choice X* will be lighter than that of *choice Y*? Why?
- Do you think that *choice X* retains the value of raw materials more than *choice Y*? Why?

3 – CONCLUSION

Ask every student to describe an old or replaced, repaired, recycled etc. electrical or electronic device of their own on a post-it, using the following questions:

- Where do you think your old device is now?
- Are the device or the materials in it still being used? Why or why not?

The students stick their post-its on the diagram (appendix 3) beside the R strategy that corresponds to what has happened to their old device. It is not a problem if students do not know where their post-it belongs. Students who do not know where to hang their post-its should place them beside the diagram. Then discuss the post-its and the corresponding R strategies.

- Which R strategy has the most post-its? Why is that, do you think?
- What happens to these devices?

Point to the REPAIR R strategy in the diagram.

- What post-its are beside this R strategy? Why? How many devices does this represent?
- (If there are few post-its there) Why do you think there are so few post-its for this R strategy?

Make connections with the choice described on the orange card for the REPAIR R strategy (appendix 4).

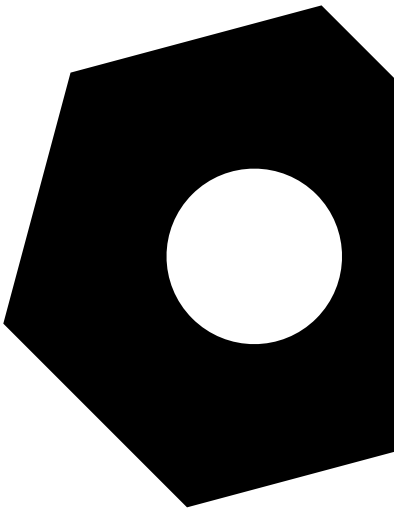
- Why would … do this? What would you do in this situation?
- Have you ever repaired a device or had it repaired? What kind of device was it? Where was it repaired and by whom? Was it difficult or easy? Why? Was it expensive? Why?
- Have you ever consciously chosen not to have a device repaired? Why?

Look at the post-its beside the diagram and discuss in the group whether or not they belong to any of the R strategies. Hang the post-its in the right place.

- Are there any devices on post-its beside the diagram?
- What post-its don't correspond to any R strategy? (for example an old smartphone that has been in a drawer for years) Why not?

Explain that the raw materials in broken, worn or dated electrical and electronic devices usually do not return to the material cycle because households tend to keep such devices in a drawer indefinitely. Devices in households that are no longer in use and whose raw materials are lost to the circular circuit are called 'dormant devices'.

- What is the difference with dumping a device in landfill? What do you think is worse?
- What could you do to ensure that the materials in your dormant devices return to the material cycle?

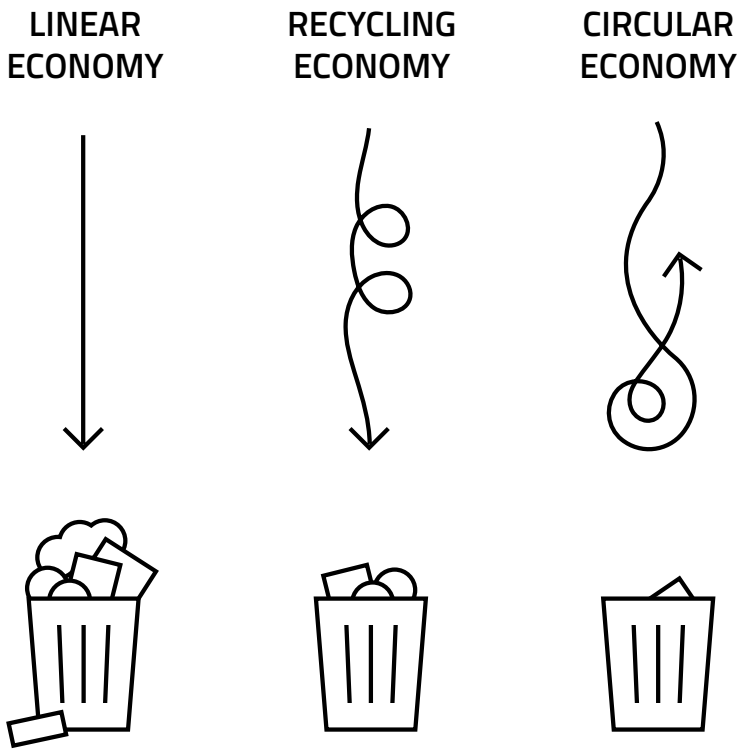


TIP MODULE 2 MODULE 3 MODULE 4 MODULE 5

After this lesson, you could explore perspectives, opinions and emotions concerning electrical and electronic devices with your students (module 2), or have them explore why they should return their dormant devices to the material cycle or how best to do this (module 3), what the underlying causes (and consequences) of this could be (module 4), and/or ask them to devise some form of action, for example collecting dormant devices at school or in the neighbourhood (module 5).

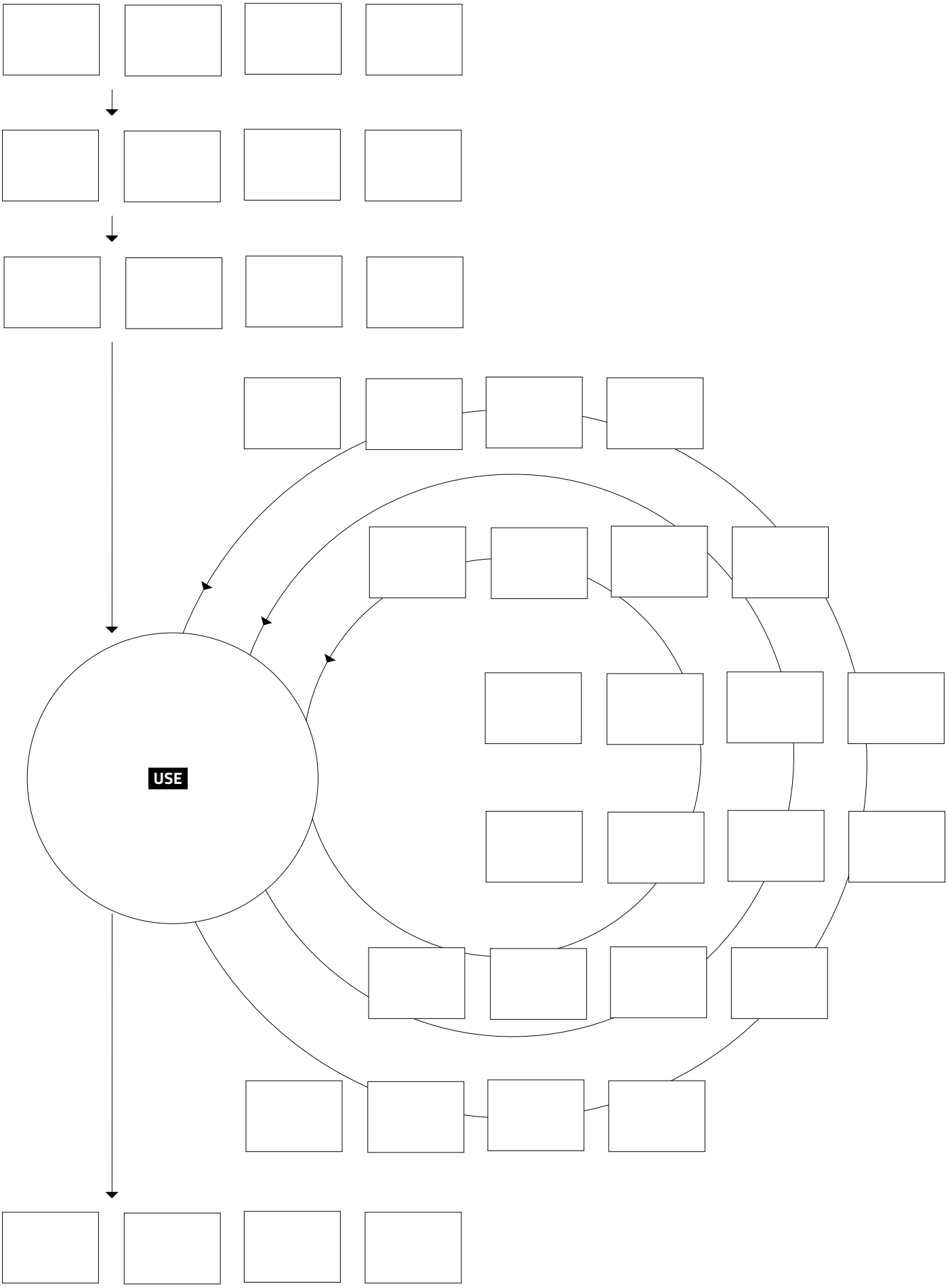
APPENDIX 1

APPENDIX 2



Source: https://vlaanderen-circulair.be/nl/kennis

APPENDIX 3



Based on https://www.rvo.nl/onderwerpen/r-ladder/

APPENDIX 4

R0	**Refuse**	Making a product unnecessary by doing without it.	There's a new iPhone model on the market with a much better camera. Amir wants to take better pictures, but his current older iPhone with camera is still working perfectly. He decides not to buy the newer model and to keep using his old smartphone until it breaks.
R1	**Rethink**	Using a product more intensively, for example by sharing it or making it multifunctional. Or by designing a product differently, by increasing repairability or making greater use of recycled material.	Emma would really like to buy the latest Harry Potter game, but she doesn't have a PlayStation. She's spotted a discounted PlayStation online, but then remembers that her friend Kiara, who lives two streets away, has a PlayStation and that the game can be played in multiplayer mode. They decide to put together the money for the game and play it every Friday evening on Kiara's PlayStation.
R2	**Reduce**	Manufacturing a product more efficiently, for example by using fewer resources or materials, or using it more efficiently, for example by reducing how much energy it consumes.	Meyra's parents are getting very high energy bills every month. They discuss with their teenage children how they can reduce their energy consumption. They decide to switch off all devices (TV, laptop, phone charger, etc.) when they are not being used instead of leaving them on standby.
R3	**Reuse**	Reusing a discarded product in good repair for the same purpose.	Samira's laptop is broken. It's too expensive to have the device repaired, but she doesn't want to buy a new laptop either. She decides to buy a second-hand laptop instead.
R4	**Repair**	Repairing and maintaining a broken product to prolong its use.	The cable of Meskerem's earphones is broken. She looks online for repair options and decides to have the cable repaired at a local Repair Café.
R5	**Refurbish**	Renovating and modernizing an old product.	Olivia's grandma gave her a used old lamp. She renovates the lamp and turns it into a modern vintage lamp for on her bedside table.

R6	**Remanufacture**	Using parts from a discarded product in a new product for the same use.	The water reservoir in Liam's Senseo coffee machine is broken, but his neighbour has an old machine somewhere that he no longer uses. Liam replaces his broken water reservoir with his neighbour's and then the machine works again.
R7	**Repurpose**	Using a discarded product or its parts in a new product with a different use.	Yassin buys a vintage TV in a thrift store and turns it into an aquarium with lights.
R8	**Recycle**	Processing materials while preserving the same quality (high-grade) or creating lower quality (low-grade).	Nathan's laptop is broken and it can't be repaired. He brings the laptop to a recycling centre, where the high-grade materials are extracted from computers to be reused as raw material for new products.
R9	**Recover**	Burning materials with energy recovery.	Nathan's laptop is broken and can't be repaired. He brings the laptop to a recycling centre, where the recyclable plastic parts are recovered from computers to be used as raw material for new products.

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our partners, Repair&Share, Maakbaar Leuven and the municipalities of Apeldoorn and Roeselare for their expertise on the subject and their feedback.

PERSPECTIVES, OPINIONS AND EMOTIONS

TARGET AUDIENCE 14 to 18 years

SHORT SUMMARY During this lesson, the students explore their own and other people's opinions, perspectives and emotions with regard to the production, consumption and repair of electrical and electronic devices, as well as the impact that their own choices have.

REQUIRED PRIOR KNOWLEDGE Students are familiar with the basic principles and frameworks with regard to dealing sustainably with electrical and electronic devices (design phase, circular economy, R strategies, dormant devices, etc.). Students are able to adopt a particular point of view and formulate arguments ('therefore', 'because', 'given that', etc.).

MODULE 1

Interreg North-West Europe SHAREPAIR
djapo
België partner in ontwikkeling
Vlaanderen verbeelding werkt

PERSPECTIVES, OPINIONS AND EMOTIONS

DURATION ▸ 50 minutes

LEARNING OUTCOMES

- Students are able to form an opinion on the production, consumption and repair of electrical and electronic devices.
- Students are able to provide arguments to support their opinion on the production, consumption and repair of electrical and electronic devices.
- Students explore other perspectives on the production, consumption and repair of electrical and electronic devices.
- Students explore their emotions with regard to the production, consumption and repair of electrical and electronic devices.
- Students have the inner confidence to change their views on the production, consumption and repair of electrical and electronic devices.
- Students understand how their choices with regard to the production, consumption and repair of electrical and electronic devices can contribute to a more circular economy.

MATERIALS REQUIRED

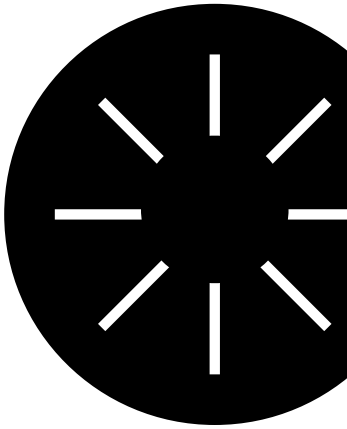
- A whiteboard or flip chart
- Propositions or statements on the repair of electrical and electronic devices (appendix 1)
- Post-its
- A piece of thread
- Stock photos on the production, consumption and repair of electrical and electronic devices (appendix 2)
- Five possible quotations from the people in the stock photos (appendix 3). One quotation per photo.
- 'What if' critical thinking questions on repairing electrical and electronic devices (appendix 4)

TO DO BEFOREHAND

- Read the Background Information document attentively. This text gives you the what, why and how of the subject and the didactic knowledge and insights you need to work with this module.
- Choose those elements from the module that suit your students best and are most compatible with previous and planned lessons.
- Choose one or more propositions (appendix 1) that are likely to interest your students and correspond to their prior knowledge, and write or hang them on the whiteboard or on a flip chart at the beginning of the lesson. Reformulate them if required or draft propositions yourself; if you choose to do this, formulate clearly and unambiguously and avoid vague words such as 'sometimes' and 'perhaps'; also avoid including an argument in the proposition. Create two columns under each proposition, one marked 'agree' and the other 'disagree', and connect the two outer ends with each other by hanging a piece of thread horizontally across the whiteboard or the flip chart.
- Print the five stock photos (appendix 2) and hang them in different places in the classroom or on the whiteboard or flip chart. You can also print the quotations (appendix 3) (without the number of the photographs) as cards.
- Select one or more 'What if' critical thinking questions (appendix 4) that are likely to interest your students and that correspond to their prior knowledge. These critical thinking questions are based on the propositions (appendix 1) and relate to future situations with regard to the consumption and production of electrical and electronic devices, situations that either facilitate or impede the creation of a circular economy. The situations are set in the near or distant future, and are formulated either in specific or in general terms. You could also use critical thinking questions of your own or ask the students to come up with several 'What if' questions themselves on the basis of the propositions (appendix 1).

LESSON PLAN

1 – STIMULUS



Use the *Akkoordkoord (Thread of agreement)*(© Djapo)[1] method to help students reflect on their own views, to support them with arguments and to acquire the inner confidence to change them if need be.

Hand out post-its to the students and read the proposition or propositions you have chosen (appendix 1) aloud. Then ask the students to write down their name on the post-it, as well as one reason why they agree or disagree with the proposition. Their argument must include a short explanation as to why they agree or disagree and an example from their own experience or from a previous lesson that backs this up. Then ask them to stick the post-it on the thread between 'agree' and 'disagree', in a spot depending on whether their opinion is closer to 'agree' or to 'disagree'. Then discuss the positions of the various post-its in class and ask the students to give arguments for their opinions.

Leave the thread and post-its there until the end of the lesson.

TIP MODULE 3

Encourage the students to write any questions they have about the topic on a flip chart. Tell them you will discuss these questions during a future class.

1 ~ *The Akkoordkoord ('Thread of agreement')* method is part of Djapo's *Filosoferen (Doing Philosophy)* method. The students explore their thoughts, ideas and opinions during work methods that help prepare for philosophical conversation. Their thoughts and ideas, and their thinking process as a whole, enrich the ensuing philosophical conversation. Doing philosophy is a thinking skill that you can use to sharpen the students' critical capacity and inspire an active sense of citizenship. It means exploring concepts and values during a philosophical conversation. For more information about doing philosophy, visit www.djapo.be.

2.1 – Who am I?

Use the *Rarara, wie ben ik? (Who am I?)* (© Djapo)[2] method to familiarize students with other people's perspectives and with the habit of putting themselves in other people's position.

Hang the stock photos (appendix 2) in different places in the classroom. Ask the students to go around and look at them. Then read the quotations (appendix 3) aloud one by one.

- Which quotation belongs to which photo? Who could have said what?

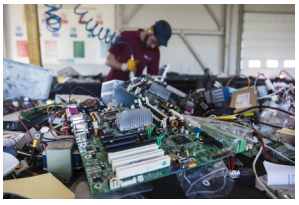
Ask the students to stand near the stock photo with the person who they think might have said the sentence that has just been read. Alternatively, pin the photos to the whiteboard or flip chart and print the quotations on cards. Then ask the students to pin the quotations under the corresponding photo.

Ask a number of students why they are standing where they are and then reflect on their answers.

- Why do you think this person is the best match for this quotation?
- Who agrees with this? Who disagrees? Why?
- Do you think this person has always been a good match for this quotation? Why or why not?
- Where are most or fewest students standing?
- Is there a photo that nobody chose? Why does the quotation not match this person?

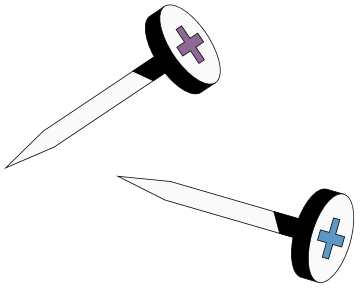
Also reflect on what they see in the photo and, together with the students, explore the connections between the photos.

- Where could the event depicted by the photo be taking place? Why?
- What do you think the person in the photo is doing? Why would they be doing that?
- How do you think the person in the photo feels? Why would this person feel like this?
- What is the connection between what the person in photo 1 is doing and what the person in photo 2 is doing?
- Do you think the person in photo 5 feels the same way as the person in photo 3 …?



2 ~ *The Rarara, wie ben ik? (Who am I?)* method is part of Djapo's *Systeemdenken (Systems Thinking)* method. Systems thinking helps students to explore our complex world by consciously looking for connections. It helps them develop a nuanced perspective on the world, and to remain alert to the various points of view in any story. This helps them to defer judgement before adopting an opinion, and to gain greater insight into complex themes. For more information about systems thinking, visit www.djapo.be.

Visualize the connections by drawing a horizontal arrow or timeline on the whiteboard and pinning the photos and quotations on the arrow or timeline in chronological order. Explain that this represents a linear economy. Then draw a circle or loop on the whiteboard and ask the students to try to pin the photos and quotations on the circle. Explain that the circle or loop represents a circular economy.



- Would the photos and quotations be the same for a circular economy?
- Which photos would look different? Why?
- Which photos would you not be able to take in a circular economy? Why not?
- Which quotations would be different in a circular economy?

TIP MODULE 1

Make connections with the visualizations and explanations on the circular economy from the first lesson. Also ask whether the students recognize any of the R strategies in this chronological series of photos.

DIFFERENTIATION

Alternatively, ask the students in pairs to write a caption or social media post for one of the stock photos.

- Imagine that this photo is going to be posted on Sharepair's Facebook page. What text would you post with it?
- Also think of an appropriate hashtag and choose two emoticons.

The students write down or hang their caption and social media post under the stock photos or under the corresponding number on the whiteboard.

Take out the *Thread of agreement* again. Go over the propositions on the whiteboard and ask the students to imagine what the opinions of the people in the pictures might be.

- Would the person in this photo agree or disagree with this proposition? Why?

Then ask the students to pin the photos and quotations to the *Thread of agreement*, and to explain why they have chosen the spot they have chosen.

- The person in photo 1 would disagree, because …
- The person in photo 2 would agree, because …

2.2 – Route Map

Use the *Routekaart (Route Map)* (© Djapo)[3] method to teach students to inquire into the consequences of a situation and to judge these consequences as either positive or negative.

Write the 'What if' critical thinking questions (appendix 4) you have selected at the top of the whiteboard or flip chart and read them out loud. Then explain that you are going to use the *Route Map* method to find an answer to these critical thinking questions.

TIP

While making the *Route Map*, use language that emphasizes the students' thinking processes. This helps them become aware of these processes, to learn to articulate them and to notice their utility. Use words such as 'cause', 'possible consequence', 'if … then …', 'situation', 'perspectives', etc.

Step 1 – Anticipate consequences

Articulate the baseline situation as a hypothesis. Write the hypothesis in the top left corner under the critical thinking question and draw an empty dot under it.

- Every young person must take a basic repair course.
- Every student gets their own school laptop.
- Electronics manufacturers are banned from producing new smartphones until all existing smartphones have been repaired.
- Consumers are banned from buying a new smartphone unless they hand in an old, faulty and non-repairable smartphone.
- Consumers are banned from owning any electrical or electronic domestic devices, but may only lease them.
- Every newly mined resource will be heavily taxed.
- Every consumer is prepared to pay X percent more for a repairable electrical or electronic device than for a non-repairable electronic device.
- Consumers only buy electrical and electronic products if they can find all the information about the production process on the manufacturer's website.

DIFFERENTIATION

Alternatively, divide the students into groups and ask each group to select a critical thinking question. Make sure there is a clear structure by asking each group to follow the various steps, monitor progress by timing each step using an alarm, and discuss the critical thinking questions for every step in the class. This is a way for the students to carry out the exercise step by step themselves.

Ask the students to reflect on whether they think at the current time that the event in question is positive or negative.

Ask the students to reflect on possible consequences of the baseline situation. Guide them through this process by asking questions.

- What if …?
- What could the possible consequences be of … ?
- If …, then … ?
- What do you think would happen if …?
- What do you think it would mean if … ?

3 ~ *The Routekaart (Route Map)* is a visual reasoning instrument developed by Djapo, which also helps students to practise systems thinking. Visual reasoning instruments help to visualize your thinking and enable others to join in your thinking process. Systems thinking helps students to explore our complex world. It helps them develop a nuanced perspective on the world, a perspective which is alert to the various points of view in any story. Systems thinkers think about problems in as many ways as possible, are open to continuing to inquire into reality and are prepared to change their point of view. For more information about visual reasoning instruments and systems thinking, visit www.djapo.be.

Write down the consequence to the right of the hypothesis and draw an empty dot under it.

› For example, for the hypothesis 'Consumers are banned from owning any electrical or electronic devices, but may only lease them':
› Manufacturers can't sell any products anymore, only lease them out.
› And for the hypothesis 'Consumers only buy electrical and electronic products if they can find all the information about the production process on the manufacturer's website':
› Manufacturers will be as transparent as possible about the production process on their website.

If the students come up with multiple consequences, split the line into a 'fork' and list the consequences below each other. Leave sufficient space between the direct consequences for further bifurcations.

Ask the students to look at a possible consequence and come up with new consequences of this first consequence. Encourage them to think on the basis of the new situation, not of the baseline situation.

› If you look at this consequence, what could a further possible consequence be?
› What if … ?
› If …, then … ?

Write down every consequence to the right of the cause and draw an empty dot under it.

› For example, for the hypothesis 'Manufacturers can't sell any products anymore, only lease them out':
› Manufacturers will only make devices that have longer lifespans and are easier to repair.
› And for the hypothesis 'Manufacturers will be as transparent as possible about the production process on their website':
› Manufacturers will do their best to prevent types of mining and production etc. that pollute the environment and are degrading for human beings.

If the same cause has multiple consequences, split the line further. For example, for the hypothesis 'Manufacturers can't sell any products anymore, only lease them out':
Consumers are dependent on the rental prices set by the manufacturers.

DIFFERENTIATION

Consequences differ depending on the standpoint from which you view the issue. You can broaden the inquiry by actively articulating different perspectives, for instance:

› What would this mean for you or me?
› What would this mean for an African mine worker?
› What would this mean for an employee in a phone shop?
› What would this mean for the CEO of an electronics manufacturer?

DIFFERENTIATION

If any consequences are mentioned that are untrue or doubtful, put a question mark behind them and encourage the students to think about them further afterwards.

Step 2 – Judging consequences

Go over the consequences that the students have mapped together in class.

Ask them to judge every consequence either positively or negatively. Also ask for arguments to support their judgement, to encourage them to reflect more deeply on their judgement. There is no need to resolve conflicting judgements between students.

Colour the empty dot below any consequences that are judged positively green. Colour the dot below any consequences that are judged negatively red. If opinion is divided or if the consequence can be judged both positively and negatively, then colour the dot half red and half green.

Do you think this consequence is positive or negative? Why?
Do you think this consequence is good or bad? Why?

Then ask the students to think about the baseline situation again and whether they judge that event positively or negatively now that they have considered all the possible consequences. Ask them to share the outcome with the group.

- Now you have considered all the possible consequences, what do you think about the initial situation?
- How did you judge or assess the initial situation at the start?
- Has your opinion about the initial situation changed since then? Why or why not? Discuss.

What if electronics manufacturers were banned from producing new smartphones until all existing smartphones have been repaired?

Consumers are banned from owning any electrical or electronic domestic appliances, but may only lease them.

Manufacturers can't sell any products anymore, only lease them out.

Manufacturers will only make appliances that have longer lifespans and are easier to repair.

Consumers are dependent on the rental prices set by the manufacturers.

Step 3 – Judging the result

Ask the students to look at the result and explain what they think about it.

- Are you satisfied with the result?
- Did any consequences surprise you?
- Are there consequences you did not expect?
- Did the exercise give you a clearer picture of the situation?

Step 4 – Reflecting on the thinking process

With the whole group, go over the steps the students took and ask about their experiences with regard to their thinking process.

- We began with a critical thinking question. How did this question affect you?
- Was it easy to think of consequences? Why?
- How did it make you feel to hear the consequences suggested by the other students?
- What happened when you had to think about the consequences of consequences?
- How did judging the consequences go? Why?

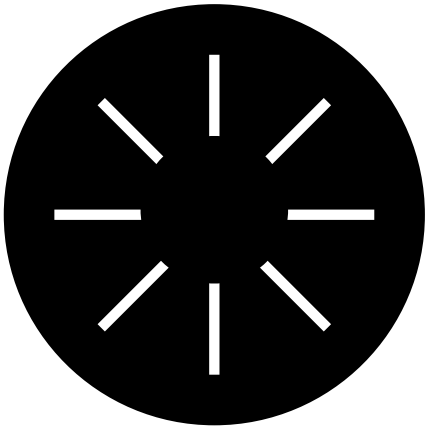
TIP MODULE 5

Leave the *Route Map* where it is or keep the flip chart page or the whiteboard diagram for a later lesson. Use it to test things that come up in other modules against positive and negative scenarios in the *Route Map*, for example in module 5:

- What positive consequences in our *Route Map* could our activity contribute to?
- Could our action also have negative, undesired consequences?

3 – CONCLUSION

Take out the *Thread of agreement* again and tell the students they can move their post-its to a different place if they wish. This is a way for them to confirm or change their opinion.



Reflect in the whole group about changing opinions.

- Who has changed their opinion? Why? Who hasn't? Why not?
- Is it difficult to change your view? Why?
- What do you need before you can form your opinion?

Explain that it is important to have the inner confidence to change your initial point of view. Your perspective on the world can change as you receive new information. This also means your opinions may change over time. Discuss this.

- We have examined our own and other people's perspectives. How did that make you feel? What insights has this given us?

Every young person must take a basic repair course.	**Every student must be given their own school laptop.**	**Electronics manufacturers are banned from producing new smartphones until all existing smartphones have been repaired.**
Consumers are banned from buying a new smartphone unless they hand in an old, faulty and non-repairable smartphone.	**Consumers are banned from owning any electrical or electronic domestic devices but may only lease them.**	**Every newly mined resource must be heavily taxed.**
I am prepared to pay twenty percent more for a repairable electrical or electronic device than for a non-repairable device.	**I only buy electrical and electronic products if I can find all information about the production process on the manufacturer's website.**	

APPENDIX 2

1

2

3

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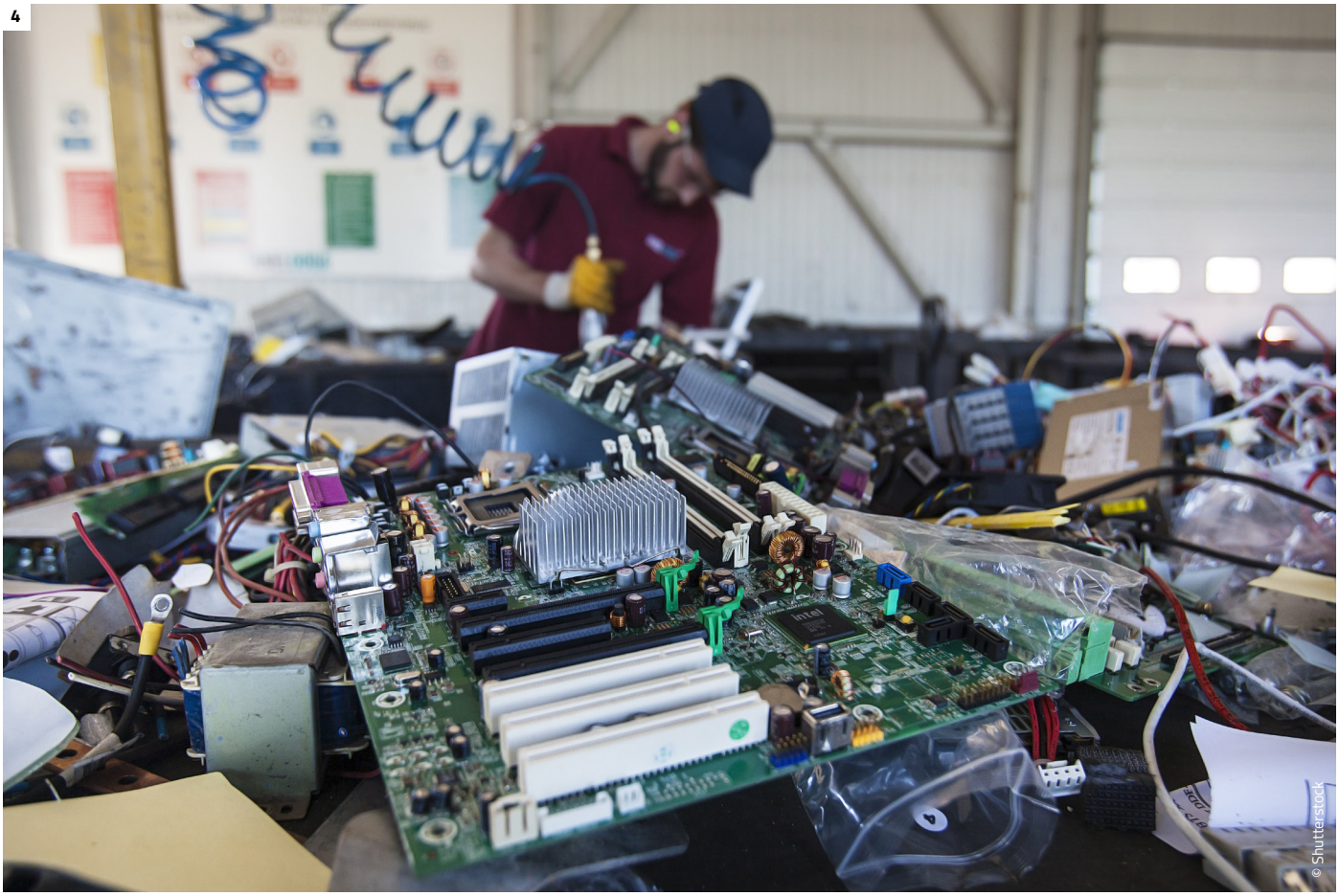
4



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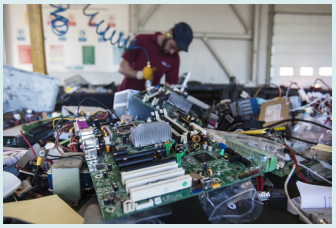
5

APPENDIX 3

I know my job is unsafe, unhealthy and badly paid, but this is the only paid work I can find near my home. Because of the work I do, people on the other side of the world can buy a new smartphone.

It gives me a lot of satisfaction to repair a device myself. I don't have all the tools I need at home, but you can do a lot even with a simple screwdriver. I sometimes watch a 'how to' video on YouTube, but I've been repairing products for a while now and notice I'm getting better at it.

The nearest recycling centre is a bit of a drive, but I'm glad the materials in my old devices will get a new destination. I've thought about using these devices for longer and repairing the broken ones, but the new models on the market now are much more energy-efficient.



Every day I recover the most valuable materials from discarded devices. We have so many of them, I sometimes wonder where they all come from. The parts I take out are recycled or reused as part of a new device. The remaining material is thrown into big containers. I don't know where they are shipped.

I moved from the countryside to this neighbourhood in the outskirts of the city. Just like thousands of other people, I come here every day to find valuable materials. I miss the countryside and am ill a lot of the time, but I make more money doing this than I did in agriculture.

What if every young person must take a basic repair course?	**What if every student were given their own school laptop?**	**What if electronics manufacturers were banned from producing new smartphones until all existing smartphones have been repaired?**
What if consumers were banned from buying a new smartphone unless they hand in an old, broken and non-repairable smartphone?	**What if consumers were banned from owning electrical or electronic domestic devices, but may only lease them?**	**What if every newly mined resource were heavily taxed?**
What if all consumers were prepared to pay X percent more for a repairable electrical or electronic device than for a non-repairable device?	**What if all consumers were only to buy electrical and electronic products if they could find all the information about the production process on the manufacturer's website?**	

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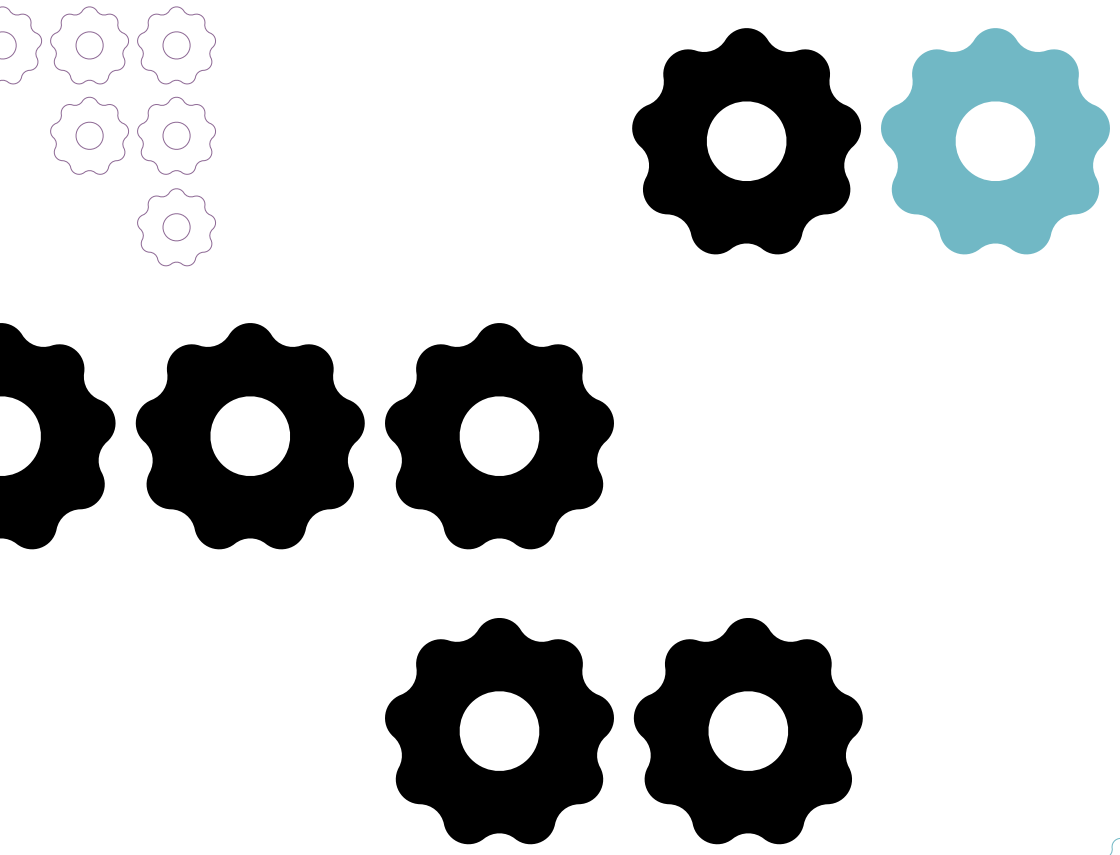
RESEARCH SKILLS

TARGET AUDIENCE 14 to 18 years



SHORT SUMMARY During this lesson, the students investigate the repair options, lifespan, consumption etc. of electrical and electronic devices on the basis of a research question they choose themselves.

REQUIRED PRIOR KNOWLEDGE Students are familiar with the basic principles and frameworks with regard to dealing sustainably with electrical and electronic devices (design phase, circular economy, R strategies, dormant devices, etc.).

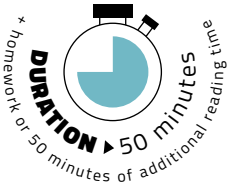
MODULE 1

MAKE IT WORK! MODULE 3

3

Interreg North-West Europe SHAREPAIR
djapo
België partner in ontwikkeling
Vlaanderen verbeelding werkt

RESEARCH SKILLS



LEARNING OUTCOMES

- Students are able to formulate a research question with regard to the production, consumption and repair of electrical and electronic devices.
- Students know how to find specific answers to questions with regard to the production, consumption and repair of electrical and electronic devices.
- Students understand how their choices with regard to the production, consumption and repair of electrical and electronic devices can contribute to facilitating a more circular economy.

MATERIALS REQUIRED

- A whiteboard or flip chart
- Market research worksheet (appendix 1)

TO DO BEFOREHAND

- Read the Background Information document attentively. This text gives you the what, why and how of the subject and the didactic knowledge and insights you need to work with this module.
- Choose those elements from the module that suit your students best and are most compatible with previous and planned lessons.
- Encourage the students to write any questions they have about the topic on a flip chart. Tell them you will discuss these questions during this class. Were any questions written down on the flip chart before this lesson? Select all questions about the production, consumption and repair of electrical and electronic devices and write them down on the whiteboard or flip chart before the start of this class.

LESSON PLAN

1 – STIMULUS

Ask the students to suggest as many in-depth questions about the repair options and lifespan of electrical and electronic devices as possible.

MODULE 1

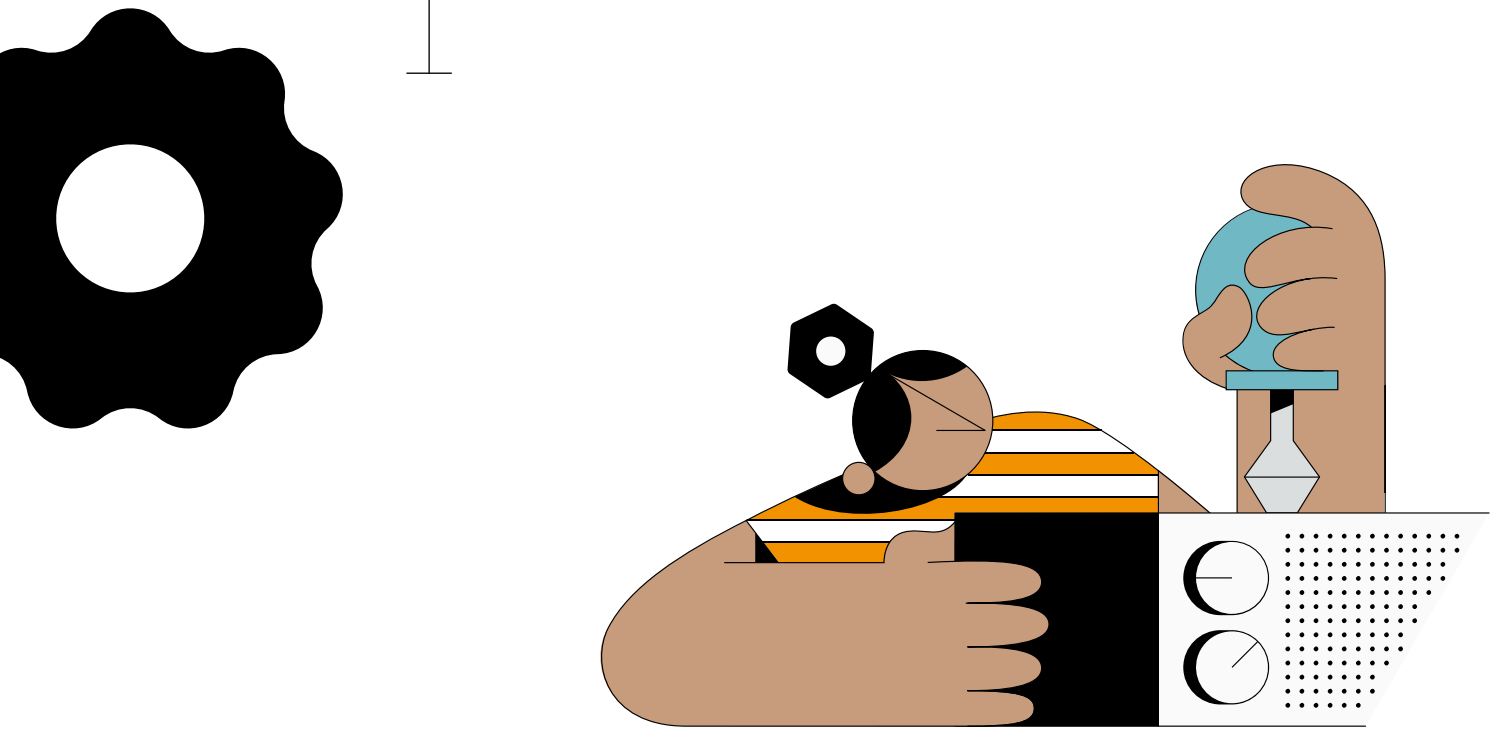
- What do we want to know more about?
- What exactly do we want to know about this issue?

Write down the questions as they are raised on the left of the whiteboard or of a flip chart. Make sure there is enough space for six columns to the right. Possible questions include:

- Why can't I disassemble *device X* myself?
- How long will I be able to run the latest programs/apps/games on my *device Y*?

TIP MODULE 2

To help students come up with questions, you could take out the *Route Map* and/or the stock photos from module 2 and briefly recap the conclusions from the previous lesson or lessons.



2 – CORE

2.1 – The most interesting question

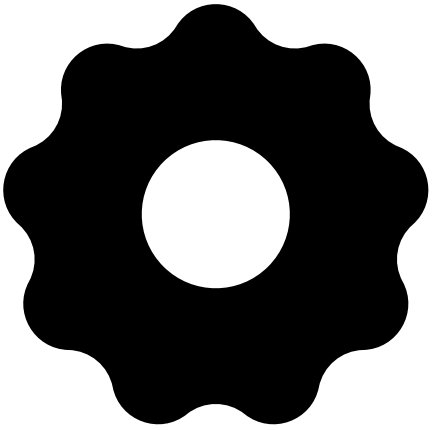
Use the *De interessantste vraag (The most interesting question)* (© Djapo)[1] method to reflect more closely on the questions and select the most interesting ones.

Discuss the questions on the whiteboard or flip chart with the class.

- Which are closed-ended questions? Could we turn them into open-ended questions?
- Which are open-ended questions? Could we turn them into closed-ended questions?
- Are these questions value-neutral?

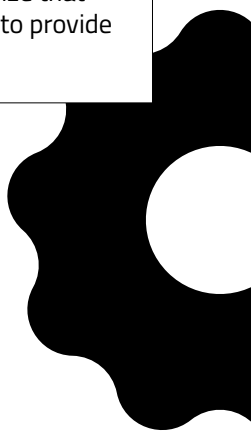
Select the most interesting questions together and explain why these questions are the most interesting ones to research. Cross out questions that are not considered sufficiently interesting.

- Which version of the question is the most interesting, the open-ended or the closed-ended one? Why?
- Are value-neutral questions more interesting than 'value-laden' questions? Why or why not?
- Which questions best take the context of the research into account?
- Do the questions suggest or imply certain answers?
- Should research questions contain any implied information? Why or why not?
- Do the questions exclude certain answers? Is that a bad thing?
- Is it OK for questions to be carefully delineated? Why or why not?



TIP

Ask the students to answer their closed-ended questions to make them realize that asking yes-no questions is unlikely to provide them with sufficient information.



Reflect on the steps that the students have gone through and ask for their experiences with regard to their thinking processes.

- Was it difficult to think of questions? Why or why not?
- Are there differences between the answers to open-ended questions and the answers to closed-ended questions? If so, what are they?

1 ~ The *De interessantste vraag (The most interesting question)* method is part of the *Creatief denken (Creative Thinking)* method by Djapo. Creative thinking means generating other ideas than those you would normally have. It means departing from the well-trodden pathways in your brain, and so discovering new connections between two elements or contexts that you had not seen before. For more on creative thinking, visit www.djapo.be

2.2 – Research question

Go over the interesting questions on the whiteboard or flip chart and discuss with the class which ones could be good research questions. Draw six columns to the right of the questions. Place one criterion for a good research question at the top of every column:

- **It must be a question**
- **Relevant**: the question has to be relevant to the subject
- **Feasible**: it must be possible to answer the question by doing research
- **Defined, sufficiently precise**: the question clearly indicates where you are going to research what and with whom
- **Concise and one question only**: the question consists of a single, clearly researchable question
- **Unambiguous**: the question is clear

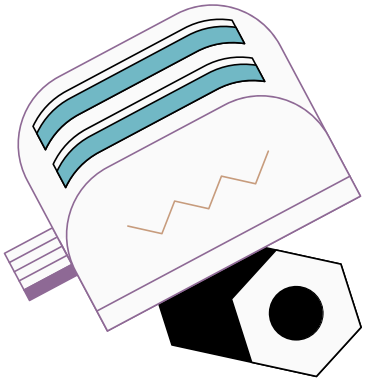
Go over the questions with the students and tick the criteria that each question meets. Questions that meet all the criteria are possible research questions.

Possible research questions about **dormant devices**:

- How many dormant devices do we have at home?
- How can I return my dormant devices to the material cycle in as time-efficient a way as possible?
- Where will my discarded *device X* go after I've handed it in to a recycling centre?

Possible research questions about **repairing broken devices or having them repaired**:

- What kinds of electrical and electronic devices are easiest to repair yourself (disassemble, availability of parts and online manuals, etc.)?
- What are the conditions for keeping the legal warranty after I have opened my *device X* of *brand Y* to try to repair it myself?
- Where can you have *device X* repaired in *region Y*? What are the differences in cost, time, etc.?
- Where will our school laptops go if they break?



Possible research questions about **conscious consumer choices**:

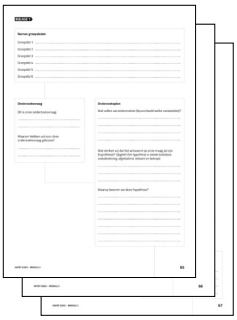
- What factors determine my choice to buy a new *device X*?
- What brands of *device X* offer easy-to-access repair options?
- Where were the raw materials used to produce my *device X* mined?
- What electronics manufacturers transparently describe the entire production process of their *device X* on their website?
- What brand or model of *device X* has the best repair score on www.indicereparabilité.fr?
- How long does the average support coverage for new software for *device X* last and how does this relate to the mechanical lifespan of the device itself or its battery, etc.?

Possible research questions about a **repair score**:

- What could the criteria be for a repair score for electrical and electronic devices?
- What are the criteria for the 'Indice de réparabilité' for electrical and electronic devices in France?

Possible research questions about **greenhouse gas emissions, value retention and cost**:

- What generates lower greenhouse gas emissions: repairing a broken *device X* or replacing it with a new, more energy-efficient *appliance X*?
- What retains more of the value of materials: recycling or repairing electrical and electronic devices?
- What is more expensive: repairing a broken *device X* (or having it repaired by the manufacturer) or replacing it with a new *device X*? Why?



DIFFERENTIATION

If your students keep suggesting the same kinds of questions, you could tell them about different types of research questions and ask them to come up with at least one research question for each category. Possible research questions[2] are:

- Counting and measuring questions: How much/many ...?
- Questions involving assessment: What do you prefer?
- Comparative questions: Which ... the most: .... or ....?
- Questions about consequences: What will happen to ... if .... ?
- Questions about connections: Is there a connection between ... and ... ?
- Questions about experience: How does it feel for ... to ... ?
- Questions about opinions: Do/does ... think that ... ? Why or why not?

2.3 – (Market) research

Divide the class into groups of three to six students. Each group chooses one research question. The groups then draw up a research plan (division of tasks, deadlines etc.) using the workbook, particularly the questions (appendix 1).

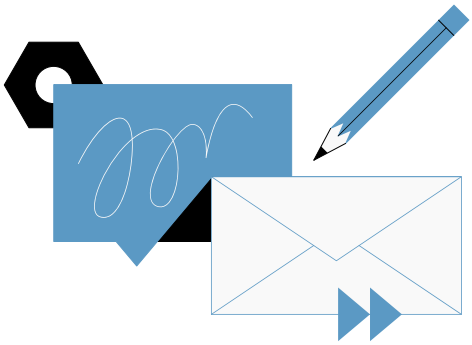
The groups can carry out their market research as homework or during the class, with or without guidance (50 minutes additional time required).

ATTENTION!

The market research for this class is highly discipline-specific: market research that the students may be required to do for their Economics class could be totally different than research for their English or Geography classes. If students have questions that touch on any other disciplines, ask a colleague from the discipline in question for assistance.

The research can take the form either of gathering information – for example online – or of inventorying the environment – for example by counting and photographing dormant devices at home. The answer to certain research questions may even require a visit to a recycling centre or a Repair Café.

2 ~ van Baren-Nawrocka, J. B.-N., & Dekker, S. D. (2019). Leidraad onderzoekend leren. Wetenschapsknooppunt Radboud Universiteit.



TIP

Clearly delineate the students' online research or help them get started by suggesting a number of handy, informative and reliable websites and tools as sources of information:

Repairing broken devices

- Find Repair Cafés and professional repairers in the vicinity of your school on this map on the Sharepair website.
- Consult the guidance tool on the Sharepair website to find advice about repairing a device or having it repaired. The tool offers general information about repair options, such as your consumer's rights within the warranty period, repairing devices yourself, having them repaired in a Repair Café or by a professional repairer, 3D printing for repair, etc., as well as specific diagnostic and repair advice for several product categories, including blenders, toasters, laptops etc.
- The Sharepair website offers background information on 3D printing of spare parts (when 3D printing is an option, what you have to look out for, where you can have it done, etc.).
- Members of Restarters.net are currently building an English-language knowledge database for repairs using the Fixometer tool, and they are logging repairs carried out during the events they organize, including the ecological and social impact of their work.
- The fixit.com website offers manuals to repair your broken devices yourself. It also has a tool to compare smartphones and tablets for repairability.

Conscious consumer choices

- The HOP website has information about how and why manufacturers apply the strategy of planned obsolescence.

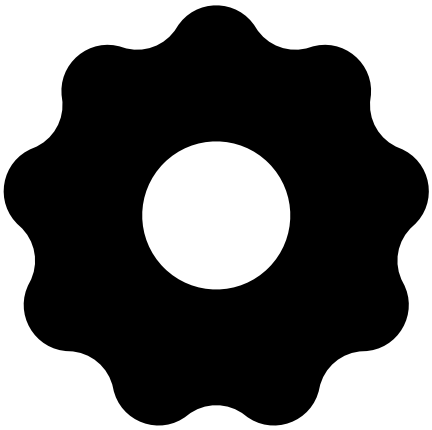
Repair score

- The following websites offer information about the 'Indice de réparabilité' or repair index that was introduced in France in 2021. This index is based on 5 easily measurable and verifiable criteria: repair information, ease of disassembly, availability of replacement parts, price ratio between reserve components and a newly purchased product, and product-specific criteria:
  - https://repair.eu/news/the-french-repair-index-challenges-and-opportunities/
  - https://www.indicereparabilite.fr/

Greenhouse gas emissions, value retention and cost

- The educational website Materials Matter tells your smartphone's life story.
- Read about the ecological, economic and sociocultural impact of mining on the Catapa website.
- The English-language documentaries 'Death By Design' and 'The E-waste Tragedy' demonstrate the often-dramatic impact of the production process and waste stream of electrical and electronic devices on our living environment and communities.
- The EEB report explains how we can save a lot of greenhouse gas emissions by using our smartphones, washing machines, vacuum cleaners and laptops longer.

3 – CONCLUSION



Reflect on the assignment.

- What was our hypothesis?
- Has our hypothesis been confirmed?
- Did this surprise you? Why or why not?

APPENDIX 1

Names of group members

Member 1 .....

Member 2 .....

Member 3 .....

Member 4 .....

Member 5 .....

Member 6 .....

Research question

This is our research question:

.....

.....

Reasons we chose this research question:

.....

.....

Research plan

What are we going to research (for example what variable or variables)?

.....

.....

.....

.....

What do we think the answer to our question will be (hypothesis)? *A hypothesis must be checkable, unambiguous, clearly defined, relevant and concise!*

.....

.....

.....

What is this hypothesis based on?

.....

.....

.....

.....

.....

.....

.....

What tasks have to be done to **prepare** properly for our research?
What materials do we need for this?
Which member of the group is in charge of carrying out this task?
When must the task be finished (intermediate deadlines)?

Task number	**Task**	**Material**	**Person in charge of task**	**Deadline**
Example	*Draft a survey*	*Google Forms*	*Name of student*	*... / ... / ...*

What tasks have to be done to **carry out** our research?
What materials do we need for this?
Which member of the group is in charge of carrying out this task?
When must the task be finished (intermediate deadlines)?

Task number	**Task**	**Material**	**Person in charge of task**	**Deadline**
Example	*Have respondents complete the survey*	*A notice on the online educational platform*	*Name of student*	*... / ... / ...*

Research findings

Was our hypothesis confirmed? Why or why not?

……..

……..

……..

……..

ACKNOWLEDGMENTS

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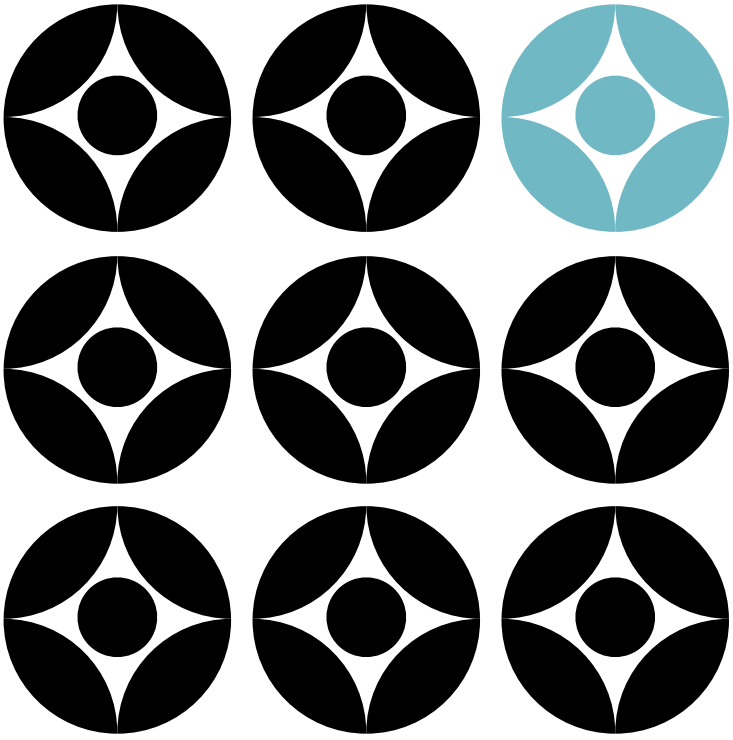
James Pickstone of The Restart Project for providing feedback on the English version of the educational package;

our partners, Repair&Share, Maakbaar Leuven and the municipalities of Apeldoorn and Roeselare for their expertise on the subject and their feedback.

UNDERLYING CAUSES AND LEVERAGE POINTS

TARGET AUDIENCE 14 to 18 years



SHORT SUMMARY During this lesson, the students process the results of their own research, or of a popular-science study that is provided to them, by identifying the underlying causes and reflecting on what they themselves could and would be willing to do.

REQUIRED PRIOR KNOWLEDGE Students are familiar with the basic principles and frameworks with regard to dealing sustainably with electrical and electronic devices (design phase, circular economy, R strategies, dormant devices, etc.).

MODULE 1

MAKE IT WORK! MODULE 4

Interreg North-West Europe SHAREPAIR
djapo
België partner in ontwikkeling
Vlaanderen verbeelding werkt

UNDERLYING CAUSES AND LEVERAGE POINTS

DURATION ▸ 50 minutes

LEARNING OUTCOMES

- Students think consciously about cause-and-effect relationships concerning the production, consumption and repair of electrical and electronic devices.
- Students think consciously about what impact they can and wish to make.
- Students understand how their choices with regard to the production, consumption and repair of electrical and electronic devices can contribute to a more circular economy.

MATERIALS REQUIRED

- A whiteboard or flip chart

TO DO BEFOREHAND

- Read the Background Information document attentively. This text gives you the what, why and how of the subject and the didactic knowledge and insights you need to work with this module.
- Choose those elements from the module that suit your students best and are most compatible with previous and planned lessons.

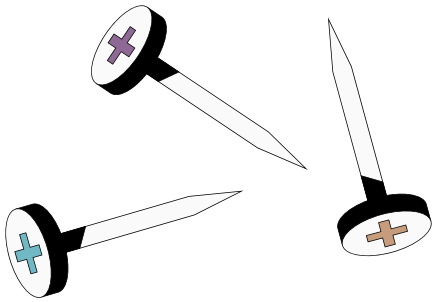
LESSON PLAN

1 – STIMULUS

Stimulate the students to identify the underlying causes behind the findings of their online market research.

MODULE 3

- What reasons might … have to … ?
- What motivates … to … ?
- How can it be that … ?
- Why would … not have taken any measures so far to … ?

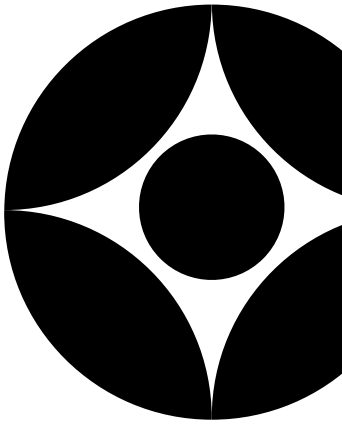


DIFFERENTIATION

If your students were not asked to do the market research, then consider showing them one or more videos, podcasts or articles about popular-scientific research on the production, consumption and repair options of electrical and electronic devices. Consider 'flipping the classroom' to have groups of students read the articles or parts of them and present them briefly to their fellow students. Your students will find more accessible information on https://materialsmatter.eu/browse or https://therestart-project.org/the-global-footprint-of-mobiles/.

2 – CORE

2.1 – Reverse thinking



Use the *Terugdenken (Reverse Thinking)* (© Djapo)[1] method to teach the students to think consciously about cause-and-effect relationships and to identify underlying causes.

Divide the students into groups of three to six, or in the same groups as during the market research. Tell them that each group will be using the *Reverse Thinking* method to find the **underlying causes** behind their research findings. This helps the students to realize that events rarely have one single, unequivocal cause, but that various causes all contribute to different degrees. Moreover, identifying the underlying causes behind their research findings will help the students to find **leverage points for change** and take the corresponding action.

Step 1 – Thinking of possible causes

Give every group a large sheet with four empty columns. The students write down a short summary of their research findings in the fourth column, the column on the right, for example:

- Electronics manufacturers make it difficult on purpose for consumers or external repairers to repair their devices.
- There are twenty dormant devices in my family home.
- Many of the discarded electrical and electronic devices that Belgians bring to recycling centres ultimately end up in landfill sites in Congo or China.
- Most smartphone manufacturers are not transparent about the full production process of their product on their website.
- The average period during which software is supported for *device X* is … percent shorter than the mechanical lifespan of *device X*.
- Having a broken laptop repaired by the manufacturer is … percent more expensive than buying a new laptop of the same brand.

DIFFERENTIATION MODULE 2

You could also describe a desired or undesired future event and then try to imagine what the hypothetical causes could be, for instance using the critical thinking questions from the *Route Map*.

- Manufacturers have a legal obligation to continue supporting software for at least 10 years (system updates and operating systems etc.) for every laptop they sell.
- Electronics manufacturers make their products easier to disassemble and they sell repair parts.

1 ~ *The Terugdenken (Reverse Thinking)* method is part of the *Systeemdenken (Systems Thinking)* method by Djapo. Systems thinking helps students to explore our complex world by consciously looking for connections. It helps them develop a nuanced perspective on the world, and to remain alert to the various points of view in any story. This helps them to defer judgement before adopting an opinion, and to gain greater insight into complex themes. For more information about systems thinking, visit www.djapo.be.

The students brainstorm per group about the reasons for this and write down at least three causes in the column immediately to the left of the research findings.

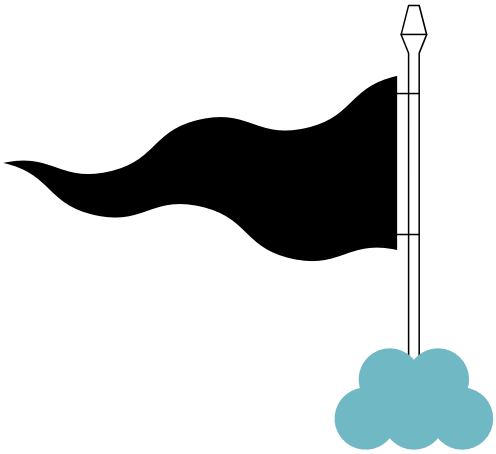
- For example, for the research finding 'There are twenty dormant devices in my family home':
  My family members are unaware of the value of the materials in their dormant devices.
- Or, for the research finding 'Electronics manufacturers make it difficult on purpose for consumers or external repairers to repair their devices':
  Manufacturers want consumers to buy as many new products as possible.

They then draw arrows from each cause to the research finding.

The students then select one of the origins in the third column and brainstorm about the reasons for this. They write down at least three causes in the second column, for example for the cause 'My family members are unaware of the value of the materials in their dormant devices':
Manufacturers are not transparent about the origins of the materials in their devices.
Then they draw arrows from each cause to the effect.

The students then select one of the causes in the second column and brainstorm about the reasons for this. They write down at least three causes in the first column, for example for the cause 'Manufacturers are not transparent about the origins of the materials in their devices':
Knowledge of the circumstances in which mine workers extract raw materials would make consumers too ashamed to buy the resulting products.

Again, they draw arrows from each cause to the effect.



Knowledge of the circumstances in which mineworkers extract raw materials would make consumers too ashamed to buy the resulting products.	→ Manufacturers are not transparent about the origins of the materials in their devices.	→ My family members are unaware of the value of the materials in their dormant appliances.	→ There are twenty dormant appliances in my family home.

Step 2 – Reflecting on causes and effects

The students reflect in their groups on what they have written down.

- Are there any other causes we could add?
- Can causes also be effects?
- Can effects also be causes?
- Can effects sometimes be invisible?
- Can negative effects themselves sometimes have positive effects?

DIFFERENTIATION

Thinking of possible effects

Groups that have the time could also think of the possible effects of their research result. If you ask them to do this, draw seven columns on their sheet. The students then write their research findings in the middle column and record the effects in the fifth, sixth and seventh columns. For example, for the research finding 'Electronics manufacturers make it difficult on purpose for consumers or external repairers to repair their devices':

- Consumers cannot find replacement parts to repair their devices.
- Consumers rarely repair their devices.
- Consumers buy a new *device X* every two years.

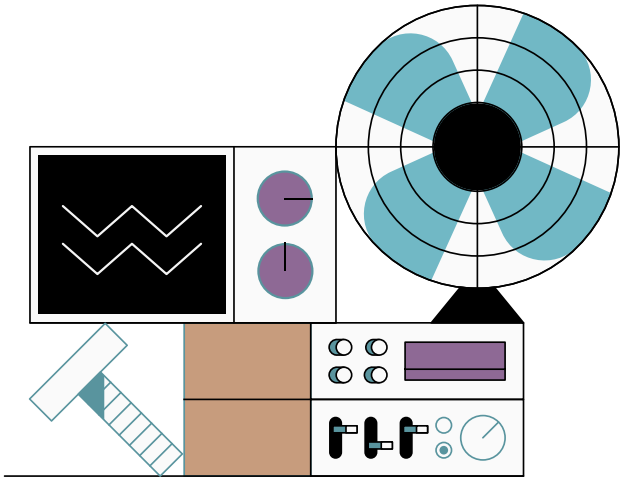
DIFFERENTIATION

If students have suggested these causes on the basis of limited prior knowledge, you could ask them to verify that the causes they have identified are correct. First, ask the students to indicate which causes they have doubts about. Then have them look online for reliable sources to support their argument.

Step 3 – Reflecting on the thinking process

With the whole group, go over the steps the students took and ask about their experiences with regard to their thinking process.

- You have been thinking of possible causes together. Did that go smoothly or not?
- Were there obstacles or difficulties when you were thinking of possible causes?
- Why is it useful to think about the causes of an event?
- Did *Reverse Thinking* help you to obtain a more complete picture of the research finding? Why or why not?
- What other situations might benefit from using the *Reverse Thinking* method?



3 – CONCLUSION

Use the *Keuzekwadrant (Choice Quadrant)* (© Djapo) to help students reflect on the causes (and effects) that the class or group would like to act on or know more about. This will help the students to find leverage points for change and take corresponding action.

The students look at the causes (and effects) on the white-board or on the flip chart. They then situate them in the *Choice Quadrant* by reflecting on:

- Which causes (and effects) are you unable and unwilling to change?
- Which causes (and effects) are you able and willing to change?
- Which causes (and effects) are you able but unwilling to change?
- Which causes (and effects) are you unable to change, but would like to change?

Turn the causes (and effects) into critical thinking questions that can be written in the top right corner of the *Choice Quadrant*, i.e., the causes (and effects) that belong both to 'I want to take action on this' and 'I think we could have an impact on this'. Do this by completing the following question for each case:

- What can and do we want to do as a class (or group) to .../to prevent ...?

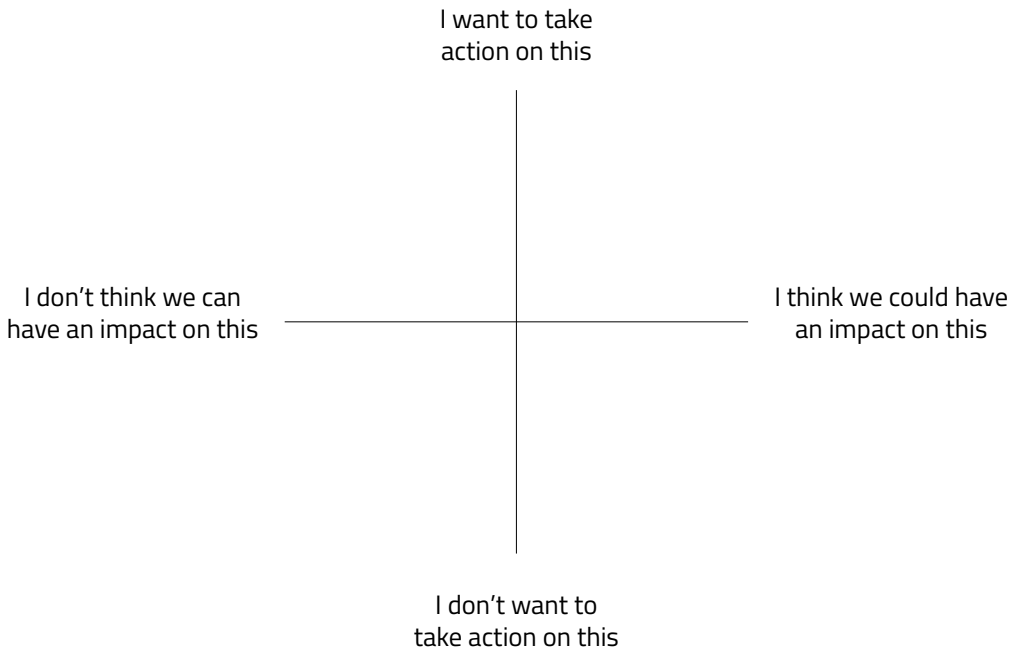
ATTENTION!

Encourage the students not to conclude too quickly that they can't do anything about something. Maybe they can't change the lifespan of batteries in general, but they could prolong the lifespan of the batteries they use themselves by using their own devices carefully, or they could stimulate the sector to change by only buying products that have sustainable batteries.

DIFFERENTIATION

If you are planning to conclude the project with this lesson, end by reflecting together on what the students have learned. Even though your students won't be doing an activity together, this is still an opportunity for you to stimulate them to consume more consciously, to do something in the future, etc.

- What are you taking from this?
- What can I do myself?



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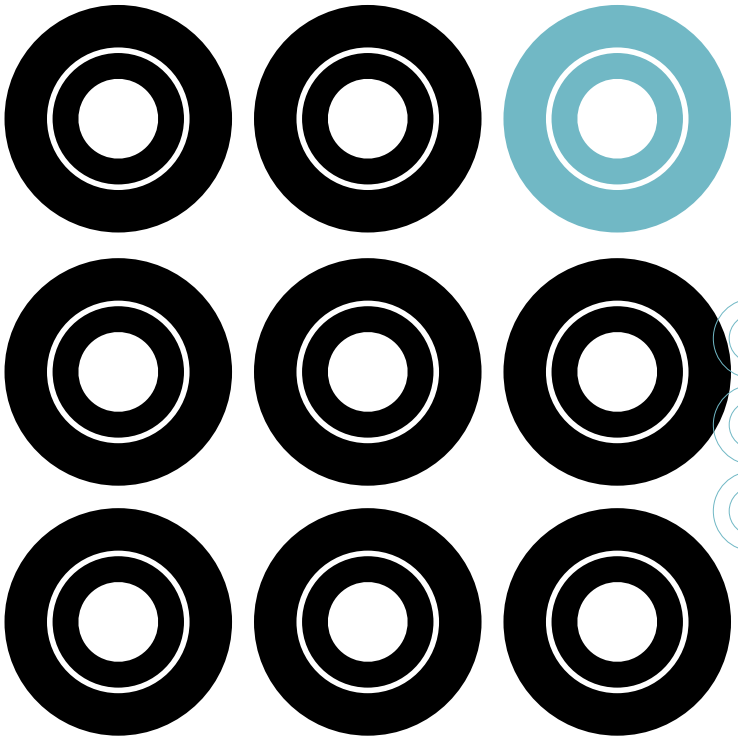
POSSIBLE ACTION

TARGET AUDIENCE 14 to 18 years



SHORT SUMMARY During this lesson, the students explore their motivation to take action themselves on the production, consumption and repair of electrical and electronic devices. Using examples and self-selected criteria, they think of ideas and possibilities to take action themselves and commit to developing and carrying out a particular activity.

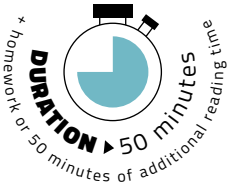
REQUIRED PRIOR KNOWLEDGE Students are familiar with the basic principles and frameworks with regard to dealing sustainably with electrical and electronic devices (design phase, circular economy, R strategies, dormant devices, etc.).

MODULE 1

KAPOT GOED MODULE 5

Interreg North-West Europe SHAREPAIR
djapo
België partner in ontwikkeling
Vlaanderen verbeelding werkt

POSSIBLE ACTION



LEARNING OUTCOMES

- Students explore their motivation to take action themselves on the production, consumption and repair of electrical and electronic devices.
- Students commit to developing and carrying out a particular activity with regard to the production, consumption and repair of electrical and electronic devices.
- Students are able to reflect critically on their learning process.
- Students understand how their choices with regard to the production, consumption and repair of electrical and electronic devices can contribute to facilitating a more circular economy.

MATERIALS REQUIRED

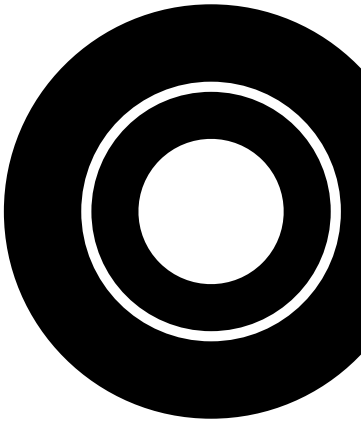
- A whiteboard or flip chart
- Several photos, videos, screenshots of social media campaigns, reports, etc. of activities by young people that encourage or contribute in some way to repairing electrical and electronic devices, for example:
  - This video about students repairing broken phones at school.
  - This video about volunteers who organize repair events.
- One large sheet per group with three concentric circles (appendix 2)
- The 'Preparing an activity' worksheet (appendix 3)
- Two sets of the six reflection memory cards (appendix 4)

TO DO BEFOREHAND

- Read the Background Information document attentively. This text gives you the what, why and how of the subject and the didactic knowledge and insights you need to work with this module.
- Choose those elements from the module that suit your students best and are most compatible with previous and planned lessons.
- Print the reflection memory (appendix 4) twice and cut out the 12 reflection memory cards.

LESSON PLAN

1 – STIMULUS



Show the class one or more photos, videos, screenshots of social media campaigns, or reports, etc. of activities by young people that encourage or contribute in some way to repairing electrical and electronic devices.

Briefly describe the activity or activities, for example:

- Supporting the Repair Everywhere campaign by repairing a device in a creative way and sharing a photo or video of this on social media.

Discuss the activity or activities, as well as the goal and motivation of the young people depicted.

- How does this activity make you feel? Why do you think that is?
- What is the goal of this activity? What is the target audience of this activity? Do you think this activity will achieve its goal?
- Do you think this activity was successful? What was a success and what wasn't?
- Would you like to participate in this activity yourself? Why or why not?
- Can we think of an activity and develop it to realize the same goal?
- What goal would you like to achieve? What goal are you thinking of?
- Can we think of an activity for this and develop it ourselves?

TIP

Summarize what was 'successful' and 'unsuccessful' about the activity according to the students and write this down in two separate columns on the whiteboard or flip chart. Leave the columns there for inspiration later, when the students are formulating criteria during step 2 of the *Bullseye* method.

BACKGROUND INFORMATION

Every activity must be goal-oriented. Students learn most if they don't simply participate in an activity (for example the Repair Everywhere campaign), but devise, develop and carry out an activity themselves. This makes them competent for action and helps them build confidence in their own capacity to make choices and shape society.

2 – CORE

2.1 – Formulating critical thinking questions

Together with the students, formulate several critical thinking questions about choosing an activity that encourages or otherwise contributes to repairing electrical and electronic devices. For each critical thinking question, complete the following sentence:

› What can and do we want to do as a class (or group) to .../to prevent ...?

The following are examples of possible critical thinking questions:

› What can and do we want to do as a group (or class) to encourage other students at school to opt to repair electrical and electronic devices as their first choice?
› What can and do we want to do as a group (or class) to convince other students at school of the importance of repairing electrical and electronic devices?
› What can and do we want to do as a group (or class) to ensure that electrical and electronic devices are designed to make repairing them easy and cheap?
› What can and do we want to do as a group (or class) to extend the lifespan of the electrical and electronic devices in our school?

Write down the critical thinking questions on the whiteboard or flip chart.

TIP

Activate the students' prior knowledge from previous lessons and ask questions about their interests and about subjects they feel strongly about.

Turn the causes (and effects) in the right top corner of the *Choice Quadrant* into critical thinking questions, i.e., the causes (and effects) that appear between 'I want to take action on this' and 'I think we could have an impact on this'. Do this by completing the following question for each case: What can and do we want to do as a class (or group) to .../to prevent ...?

Take out the *Route Map* and/or stock photos from module 2. The positive and negative consequences that the students wrote down in the *Route Map* or the feelings they felt when they looked at the stock photos could help them to deduce critical thinking questions.

TIP

Keep editing each critical thinking question until all the students agree with the goal of the activity. Try to reach consensus by ascertaining which students agree and which don't (yet).
Everyone who agrees with this critical thinking question, raise your fist.
Everyone who disagrees with the critical thinking question and wants to add something to it, raise your open hand.

Listen to what the students want to add and reformulate the critical thinking question on the basis of their feedback. Repeat and reformulate the critical thinking question until all the students raise their fist.

2.2 – Bullseye

Use the *In de roos (Bullseye)* (© Djapo)[1] method to teach students to make considered choices on the basis of pre-defined criteria.

Divide the students into groups of three to six students. Tell them that every group will be using the *Bullseye* method to answer one of the critical thinking questions on the whiteboard or the flip chart. During this exercise, the students explore what they think are the most important criteria for an activity that encourages or otherwise contributes to the repair of electrical and electronic devices. They then come up with new activities on the basis of these criteria and select an activity that they are going to develop and put into practice. This helps students become aware of what is important to them about action, which in turn will make them more motivated and make the activity they have devised more effective.

Give every group a big sheet with three concentric circles on it (appendix 2). Every group democratically chooses one critical thinking question and writes it down at the top of the sheet.

TIP

Use a stopwatch to set the time for each step in the work method, for example five to ten minutes per step. Ask the **critical thinking questions** relating to every step in class or write them down on the whiteboard.

TIP

While doing the *Bullseye* exercise, use language that emphasizes the students' thinking processes. This helps them become aware of these processes, to learn to articulate them and to register their utility. Use words such as 'brainstorm', 'coming up with ideas', 'defining criteria', 'reasons or criteria for a good idea', 'testing ideas', etc.

1 ~ *In de roos (Bullseye)* is a visual thinking instrument by Djapo which also trains creative thinking. Creative thinking means generating other ideas than those you would normally have. It means departing from the well-trodden pathways in your brain, and so discovering new connections between two elements or contexts that you had not seen before. For more on creative thinking, visit www.djapo.be.

Step 1 – Coming up with ideas

Ask the students to suggest ideas to answer the critical thinking question and write them down below each other on the left of the sheet. Ask questions to stimulate the process of thinking of ideas.

- In what ways could we ... ?
- How can someone ... ?
- Who has an idea about how to ... ?
- We want to ... How could we do this?
- Where, with whom and when could we ... ?
- What ... can we choose/do?

Ideas can be low-key and linked to existing initiatives, for instance:

- Attending a Repair Café.
- Setting up a campaign to promote a Repair Café among other students.
- Writing a communications piece to get people to sign the #Right to Repair manifesto: "this is why our class/school is signing ...".
- Designing a personalized poster to encourage students to repair broken electrical and electronic devices.

But ideas can also be ambitious or original, for instance:

- Collecting discarded electrical and electronic devices from other students in school and seeing which ones can still be repaired.
- Organizing a mini Repair Café for broken electrical and electronic devices that belong to other students in school, independently or in cooperation with a Repair Café.
- Organizing a repair competition or a hackathon between classes or schools.
- Organizing a stand at the school fair with an original repair game.
- Getting students in technical subjects to lead a repair workshop for other students.
- Going to a residential care facility to repair electrical and electronic devices together with the elderly residents.
- Recording or photographing an attempted repair by the group and posting the experience and resulting tips and tricks on YouTube or on a blog.
- Making an inventory of all dormant devices that students have at home.
- Cycling around the neighbourhood with a cargo bike to pick up dormant devices and bringing them to a recycling centre.
- Organizing an online hunt for spare parts.
- Collecting repair stories in the village, town or city and sharing them on a blog or on social media.
- Collecting broken devices and dumping them (temporarily!) outside parliament.
- Disassembling broken devices and using the parts to create a work of art, or organizing a photo exhibition or another type of exhibition on the design phase and disassembly options of electrical and electronic devices.

TIP

Find the Repair Cafés near your school on this map. This website has a guide to organizing your own Repair Café.

DIFFERENTIATION

If coming up with and carrying out activities is too ambitious for your students, you could consider preparing a simple activity or hunt yourself, and visit a local repairer with your class. For example: ask the students to look - under your guidance - for the most affordable and closest repair option for a broken school laptop.

Step 2 – Defining criteria

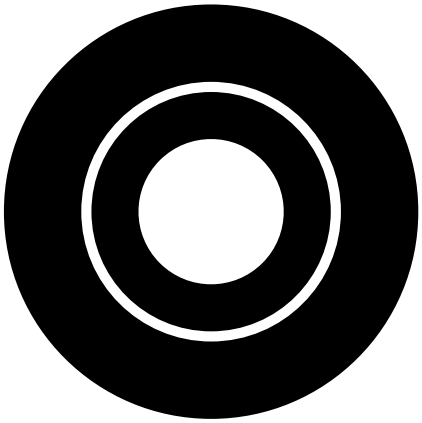
The students define criteria that the ideas will have to meet. They write down their criteria below each other to the right of the column with the ideas.

- What criteria should your ideas meet?
- What makes an idea a good idea?
- What are good conditions to set for ideas?
- What characteristics should your ideas have?
- How can you determine whether an idea is good or bad?

Propose two or three criteria yourself to help the students and their thinking process. A few examples of criteria:

- The activity has a young target audience.
- The activity involves all students in our year.
- The activity involves local residents.
- The activity is innovative.
- The activity has a lasting impact.
- The activity can be shared on social media.
- The activity can be prepared and carried out without the help of a teacher or teachers.
- The activity must not cost more than … euro.
- The activity takes place within the school building.
- The activity is prepared and carried out during school hours.

The students then democratically select three criteria that are most important to them. Encourage the students to listen to one another's views first. The students circle every criterion they select with a different colour.



DIFFERENTIATION

Set a few criteria yourself as teacher to keep the ideas feasible, such as limitations in time, place, budget etc.

TIP

It can be challenging to define criteria. If inspiration proves lacking, you could remind the students of what they wrote down in the 'successful' and 'unsuccessful' columns earlier. Ask them what the good or not-so-good aspects of each idea are. Then transform these into criteria.

- What do you find interesting about this idea?
- Everyone can take part in it.
- So should we write down as a criterion that everyone should be able to take part in it?

- What do you think is not so good about this idea?
- It costs a lot of money.
- So should we write down as a criterion that it has to be cheap?

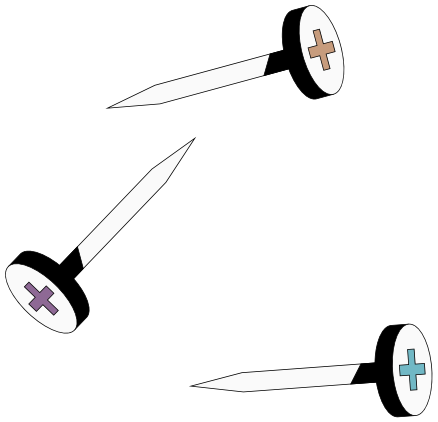
ATTENTION!

Make sure that everyone interprets the criteria in more or less the same way. 'Comfortable' can mean something different to every student. If any criteria are formulated ambiguously, ask students to look for an alternative that can be judged more objectively.

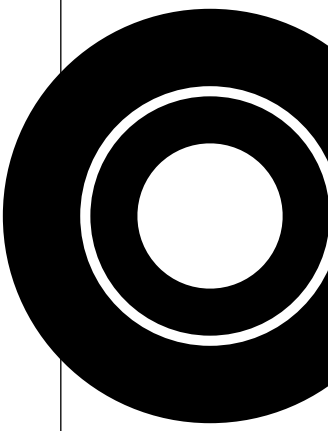
Step 3 – Checking the ideas against the criteria

Explain the following step to the students.

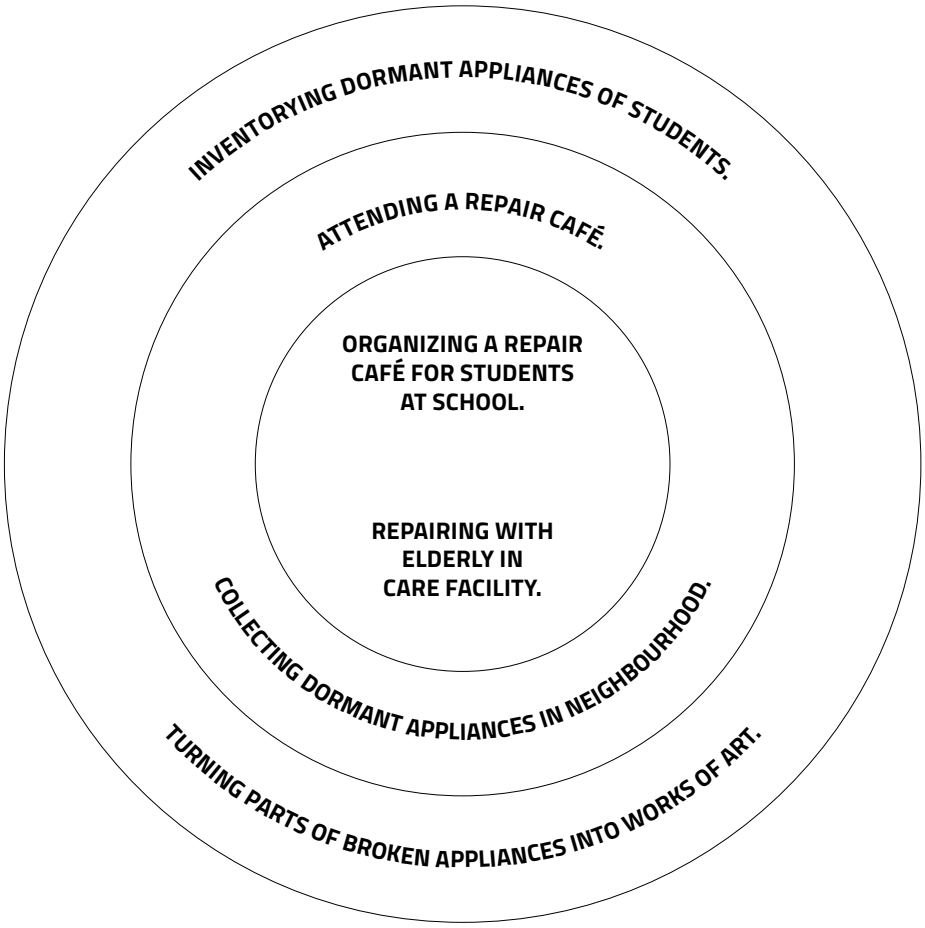
You now have a list of ideas you've come up with and you've defined what criteria these ideas will have to meet. So now you're going to check each idea against the criteria that we have selected. You do this by placing a tally mark behind an idea for every criterion it meets. Write ideas that have no tally marks outside the circles. Write ideas that have one tally mark in the outer circle, ideas with two tally marks in the second circle, and ideas with three tally marks in the bullseye.



The students then check every idea against every criterion. If an idea meets the criterion, they put a tally mark against it in the colour of the criterion. This allows them to see quickly afterwards what criteria the idea meets. Once the tally is finished, they can write every idea in the right circle.



THE ACTIVITY HAS A LASTING IMPACT.
THE ACTIVITY CAN BE SHARED ON SOCIAL MEDIA.
THE ACTIVITY INVOLVES LOCAL RESIDENTS.



Step 4 – Assessing the result

Let the students look at the result and read the ideas that have ended up in the inner circle aloud. If there are no ideas in the inner circle, then mention this. Ask the students if they are satisfied with the result, and if not, why not.

- Are you satisfied with the result?
- Did any results surprise you?
- Are there any ideas outside the bullseye that you think should be in the bullseye?
- Looking back, did you choose the right criteria?
- Are there any ideas that could be adapted so that they can be moved closer to the center?

DIFFERENTIATION

Let every student put one or more tally marks against the ideas they are most pleased with. If there are ideas that have many tally marks but are not in the bullseye, you could try to adapt these ideas so that they can be moved to the inner circle.

Step 5 – Reflecting on the thinking process

With the whole group, go over the steps the students have taken and ask about their experiences with regard to their thinking process.

- You started on the basis of a critical thinking question. What did you make of this question?
- You've been coming up with and discussing ideas together. Did that go smoothly or not?
- Were there obstacles or difficulties when you were thinking of possible ideas?
- If you were able to come up with ideas quickly, why was that?
- Once we had the ideas, I asked you to come up with criteria. How easy was it to define those?
- Then your group selected three criteria. How did that go?
- Then you checked the ideas against the criteria. Did you understand what this method was about? Did you notice anything in particular during this process?
- Did *Bullseye* help you to define your research question? Why or why not?

TIP

Take out the *Route Map* from module 2 and check the ideas for activities against the positive and negative scenarios in the *Route Map*.

- Which positive effects in our *Route Map* would this activity contribute to?
- Could our activity have any negative, undesired effects?

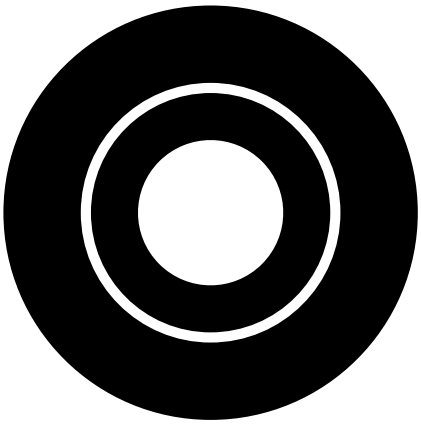
2.3 – Action

Each group of students chooses one idea to develop and carry out as an activity. The groups together draw up a plan for their activity (division of tasks, deadlines etc.) using the worksheet and the questions on it (appendix 3).

The groups of students can carry out their activity as homework, or during class, either under the guidance of the teacher (50 minutes of additional time required) or independently.

Ask the students to gather as much evidence as possible during their activity – and even during the entire course – for instance by regularly taking photos. Ask them to bring as much evidence as possible to the classroom and hang it in various places in the room.

3 – CONCLUSION



Use the *Reflectiememory (Reflection Memory)* (© Djapo) method. During this exercise, the students reflect critically on their learning process.

- How have I been learning?
- What have I learned?
- What can I do with this?

Repeat and briefly go over everything you have done in the class during this lesson or series of lessons. Place the twelve reflection memory cards (appendix 4) upside down on a table in random order. Ask a student to turn over two cards, then ask another student to do the same, etc. Whenever a student turns over two identical cards, ask them to read the reflection question on the cards aloud.

Ask another student to choose a piece of evidence and stand next to it. This student then tries to answer the reflection question on the basis of the evidence chosen. Keep playing this game of reflection memory until all questions have been answered.

Keep asking further questions and insist that the students explain their answers.

- What did you do during the preparation and execution of the project?
- How did the collaboration with other students go?
- What went well? What didn't go so well?
- Why did you feel this?
- What did you feel during the project? Why?
- What did the others feel, do you think?
- Why did you feel this was missing?
- What would you have done differently?
- Why did this motivate you during the process?
- Why are you keen to tell others about this?
- Why are you keen to do this in the future?

During this discussion, also encourage the students to reflect on the impact of their activity.

- Do you feel you've made an impact on your surroundings by carrying out your activity?
- Had you expected this?
- How could your activity have had an even greater impact?
- Do you feel that what you do somehow contributes to society?

DIFFERENTIATION

If class dynamics make group reflection challenging, you could consider lowering the threshold for the students to reflect honestly and openly by doing this exercise in small groups. Or distribute the reflection cards among half the class. The other half then moves from one dialogue partner to another every two minutes. In this way, every pair of students reflects on another reflection question every two minutes.

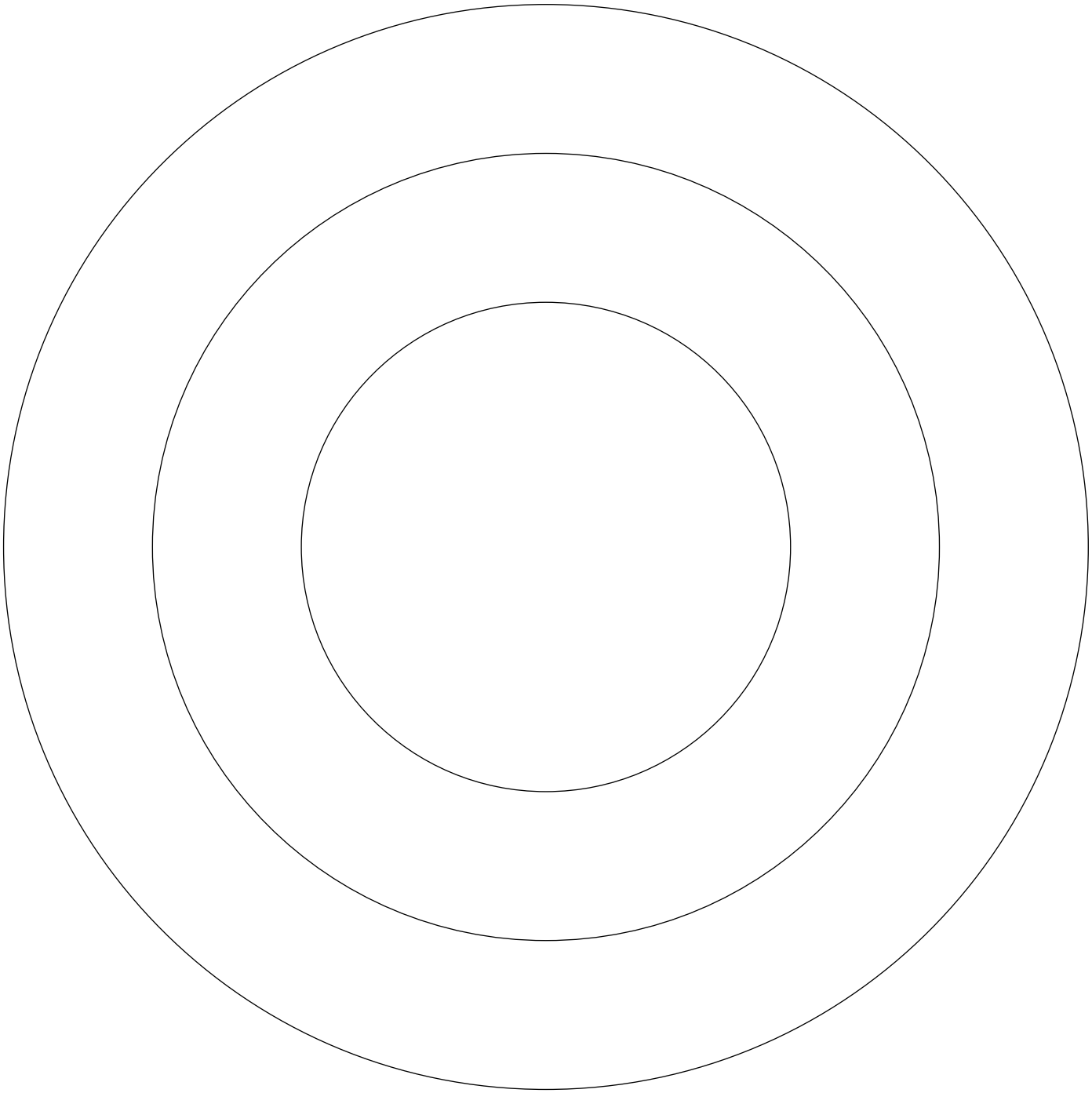
DIFFERENTIATION

If you start the series of lessons with this module, the experiences and findings of the students during this lesson could inspire them during other lessons to adopt opinions, explore the impact of their actions, come up with interesting questions, examine underlying causes, etc.

MODULE 2
MODULE 3
MODULE 4


REPAIR
EVERY
WHERE
WWW.REPAIRSHARE.BE


REPAIR
EVERY
WHERE
WWW.REPAIRSHARE.BE



APPENDIX 3

Names of group members

Member 1 .....

Member2 .....

Member 3 .....

Member 4 .....

Member 5 .....

Member 6 .....

Idea for an activity that we want to develop and carry out:

.....

.....

.....

Practical issues

When are we going to carry out our activity?

.....

.....

Where are we going to carry out our activity?

.....

.....

What is the target audience for our activity?

.....

.....

What parts of our activity are easy to organize? What parts are more difficult?

.....

.....

.....

.....

.....

Whose help do we need to carry out our activity?

.....

.....

What tasks have to be done to prepare properly for our activity?
What materials do we need for this?
Which member of the group is in charge of carrying out this task?
When must the task be finished (intermediate deadlines)?

Task number	**Task**	**Material**	**Person in charge of task**	**Deadline**
Example	*Ask the principal's permission to … during playtime*	*A polite email*	*Name of student*	*… / … / …*

What tasks have to be done to carry out our activity?
What materials do we need for this?
Which member of the group is in charge of carrying out this task?
When must the task be finished (intermediate deadlines)?

Task number	**Task**	**Material**	**Person in charge of task**	**Deadline**
Example	*Involve the other students …*	*Poster / a notice on the online educational platform*	*Name of student*	*… / … / …*

What did I like about this project?

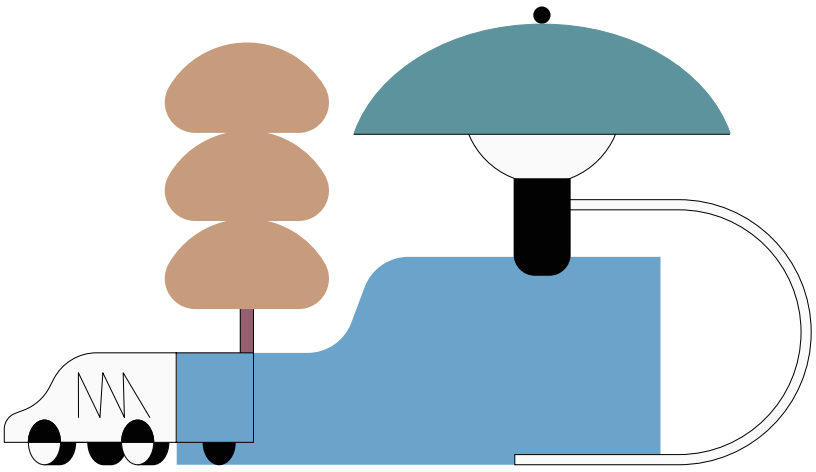
What did I feel was missing in this project?

What will I be bringing from this project to future activities?

What did I learn from this project?

What motivated me during this project?

What would I like to tell others about this project?



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