Background knowledge for teachers

Why is plastic so widely used?
There are many different types of plastic with different properties. It is an incredibly versatile material which can be moulded into a huge array of shapes and colours.

What is plastic made of?
The main ingredient in plastic is oil from fossil fuel. This is extracted from underground reservoirs and is then separated into different components at a refinery. One of these components, Naptha, is used to make plastic. It is heated until it breaks down into small molecules which are the building blocks for many types of plastic. These building blocks can then be joined together to make different types of plastics, in a process called polymerisation. After polymerisation, the plastic is in the form of small pellets or beads which can be processed into the final product. Colours and other chemicals can be added to change the appearance and properties of the final material.

What problems are associated with the production of plastic?
The production of plastic poses significant environmental challenges with far-reaching consequences. Firstly, the dependency on fossil fuels, such as oil and natural gas, for plastic production contributes to habitat disruption, air and water pollution, and the release of greenhouse gases, intensifying climate change. Additionally, the energy-intensive processes involved in plastic manufacturing lead to substantial carbon emissions. The production also contributes to resource depletion, as plastics traditionally rely on non-renewable resources.

What are the problems associated with the disposal of plastic?
The widespread disposal of plastic, often in landfills, contributes to soil contamination and competes for valuable landfill space. Furthermore, plastic waste finds its way into oceans, leading to pollution that harms marine life through ingestion, entanglement, and ecosystem disruption. The persistence of plastics in the environment, coupled with the generation of microplastics, raises concerns about long-term impacts on ecosystems and human health.

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What is the difference between new plastic and recycled plastic?
The primary distinction between new plastic and recycled plastic lies in their production processes and environmental impact. New plastic, also known as virgin plastic, is produced from raw materials traditionally extracted from fossil fuels, such as oil or natural gas. The extraction and manufacturing of virgin plastic contribute to resource depletion, greenhouse gas emissions, and environmental pollution. Recycled plastic is derived plastic waste that undergoes a process of collection, sorting, cleaning, and reprocessing. Choosing recycled plastic helps reduce the demand for new raw materials, conserving resources and energy. Recycling plastic helps divert waste from landfills, mitigating environmental harm. While both new and recycled plastics have their place, incorporating recycled plastic into products promotes a more circular and sustainable approach, reducing the environmental impact associated with the production of new plastic.

How is plastic recycled?
After collection, the plastic is transported to a recycling facility where it undergoes sorting. This step is crucial, as different types of plastic require specific recycling processes. Once sorted, the plastic is cleaned to remove contaminants like labels and food residue. The cleaned plastic is then shredded into small pieces, known as flakes or pellets. These pieces are melted and reformed into new products or packaging. The final recycled plastic product can take various forms, such as bottles, containers, or even clothing.

What are the limitations of plastic recycling?
While recycling is an important practice that helps divert plastic waste from landfills, it has certain limitations. Firstly, not all types of plastic are easily recyclable, as different plastics have distinct chemical compositions and melting points. This can lead to challenges in the sorting and recycling process. Contamination, caused by non-recyclable items mixed with recyclables, further hinders the efficiency of recycling facilities. Additionally, the infrastructure for recycling varies across regions, and not all areas have robust recycling systems in place. The quality of recycled plastic may also be lower compared to virgin plastic, impacting its usability in certain applications.

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What do the recycling codes on the bottom of plastic products mean?
The recycling codes found on the bottom of plastic products are designed to help identify the type of plastic used in a product, making it easier for consumers and recycling facilities to sort and process materials. The codes range from #1 to #7 and indicate different types of resins used in plastic production. For instance, #1 represents Polyethylene Terephthalate (PET) commonly used in water bottles, while #2 indicates High-Density Polyethylene (HDPE) found in milk cartons. Different types of plastic have distinct recycling properties. While some plastics are widely recyclable, others may require specific recycling processes. In practice, the recycling infrastructure in many regions is not currently equipped to handle all types of plastics, and certain codes are more widely accepted than others. While the recycling codes provide useful information, current recycling practices often focus only on more commonly recyclable plastics like PET (#1) and HDPE (#2).

What are microplastics?
In recent years, it has become clear that our environment is under threat from smaller, sometimes microscopic pieces of plastic. These are microplastics and are defined as plastic particles that are less than 5mm- in diameter. They are small enough to pass down our drains, through sewerage processing plants and into our rivers, estuaries and oceans. Microplastics may be tiny beads (microbeads) used in the personal care and cosmetic industries or can be formed when larger pieces of plastic degrade and are broken down by exposure to the sun, weathering and daily wear and tear.

In 2018, the manufacture and sale of such products containing microbeads was banned in the United Kingdom, but the law only applies to products that can be described as “rinse-off”. In other words, those that are used briefly then washed down the drain. However, they can still be found in many other products such as sunscreen and make-up, so the risk of them continuing to enter the environment continues.

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Lots of our fabrics and clothes, such as polyester fleeces, contain synthetic materials. When these products are washed, thousands of tiny fibres of plastic can be released into the water. They are too small to be caught in the filter of washing machines and end up going down the drain. They are even too small to be filtered out at sewerage plants so they end up in our rivers and oceans.

What happens to plastic once it is in the environment?

When improperly disposed of, plastic persists in the environment as it does not biodegrade. Plastic litter ruins both the appearance and physical make-up of landscapes, waterways, and urban areas, contributing to visual pollution. On land, plastic waste in landfills can contribute to soil degradation and contamination, therefore impacting plant and animal life. Over time, larger plastic items break down into microplastics, posing additional concerns about their impact on ecosystems and human health. In aquatic environments, plastic waste accumulates, resulting in marine pollution. Large plastic items entangle marine animals, while smaller plastics, are ingested by marine life, causing harm to the individuals, and entering the food chain thereby potentially becoming part of human diets. Many marine and land creatures have been shown to ingest or eat microplastics. Addressing these issues requires a concerted effort to reduce plastic use, improve waste management, and promote sustainable alternatives.

What are nature based solutions?

Nature-based solutions refer to approaches that harness the power of nature to address environmental challenges and promote sustainability. One example of this is a recent trial to use marine mussels to filter microplastics out of polluted seawater.