JUNIOR CYCLE

SCIENCE

Irish Aid
An Roinn Gnóthaí Eachtracha agus Trádála
Department of Foreign Affairs and Trade

WorldWise Global Schools

DOING DEVELOPMENT EDUCATION

Biodiversity
Climate change
Ecosystems
Energy generation and consumption
Global food production
Impact of human activity
Interdependence
Lifecycle of materials
Science in society
Sustainability

www.worldwiseschools.ie

CHANGING
ATTITUDES
DEVELOPING SKILLS
GROWING
KNOWLEDGE

WHAT IS DEVELOPMENT EDUCATION?

Development Education (DE) is an educational process aimed at increasing awareness and understanding of the rapidly changing, interdependent and unequal world in which we live. DE seeks to engage people in analysis, reflection and action for local and global citizenship and participation. DE is about supporting people in understanding and acting to transform the social, cultural, political and economic structures which affect their lives at personal, community, national and international levels.

Key components of Development Education:

- **Methodologies** which are learner-centered and participatory
- **Knowledge** about how the world works
- **Skills** of critical thinking, reflection, problem solving, analysis, teamwork
- **Values and attitudes** of solidarity, respect and empowerment
- **Action** to effect change for a more just and equal world

"As Science teachers we work hard to develop the skills of critical thinking, reflection, problem solving, analysis and teamwork in our students. As a Science teacher doing DE, this means we must also develop a conscience. A key aspect to solving our global challenges must be the ability to ask the difficult question: 'at what cost?' Our students must be equipped with all the tools necessary to see the bigger picture and bring harmony into our unbalanced world. DE is a vital tool to achieve this."

- Irene Hughes, Ashbourne Community School

THE AIM OF THIS RESOURCE

Development Education themes, such as conservation of biodiversity, resource lifecycles and usage, sustainability, and energy generation and consumption, all feature in the learning in junior cycle Science. This resource aims to support Science teachers to teach through a global justice lens, a lens with great educational benefits, which meets the requirements as laid out in the junior cycle Science specification, and in the (2015) Framework for Junior Cycle. It is one of a WorldWise series of resources supporting teachers in different subject areas to address Development Education-related themes and concepts as a way of challenging students to look at our world, and our place in making it more just, equitable and sustainable.

DEVELOPMENT EDUCATION (DE) AND JUNIOR CYCLE SCIENCE

The rationale for junior cycle Science recognises one of the benefits of scientific literacy as 'giving students the capacity to make contributions to political, social and cultural life as thoughtful and active citizens who appreciate the cultural and ethical values of science'. This capacity facilitates young people to 'make informed decisions about many of the local, national and global challenges and opportunities they will be presented with'. The specification aim includes a reference to the value of scientific literacy in encouraging students to analyse science issues 'relevant to society, the environment and sustainability' (NCCA, Specification for Junior Cycle Science, page 2).

STATEMENTS OF LEARNING

DE contributes to the achievement of all 8 Statements of Learning in mentioned in the junior cycle Science specification, but is particularly relevant to:

Statement of Learning 9:
The student understands the origins and impacts of social, economic, and environmental aspects of the world around her/him.

Statement of Learning 10:
The student has the awareness, knowledge, skills, values and motivation to live sustainably.

Statement of Learning 19:
The student values the role and contribution of science and technology to society, and their personal, social and global importance.

Doing DE in Science does not mean doing something extra.

KEY SKILLS

The 8 Key Skills outlined in the junior cycle framework have much in common with those engendered when a DE approach is employed. DE therefore contributes to the key skill elements articulated in the junior cycle Science specification.

Learning Outcomes

DE themes are integral to learning outcomes from across the five strands of the Science specification. This resource supports teachers to take advantage of the opportunities to create rich and layered learning experiences and outcomes for students.

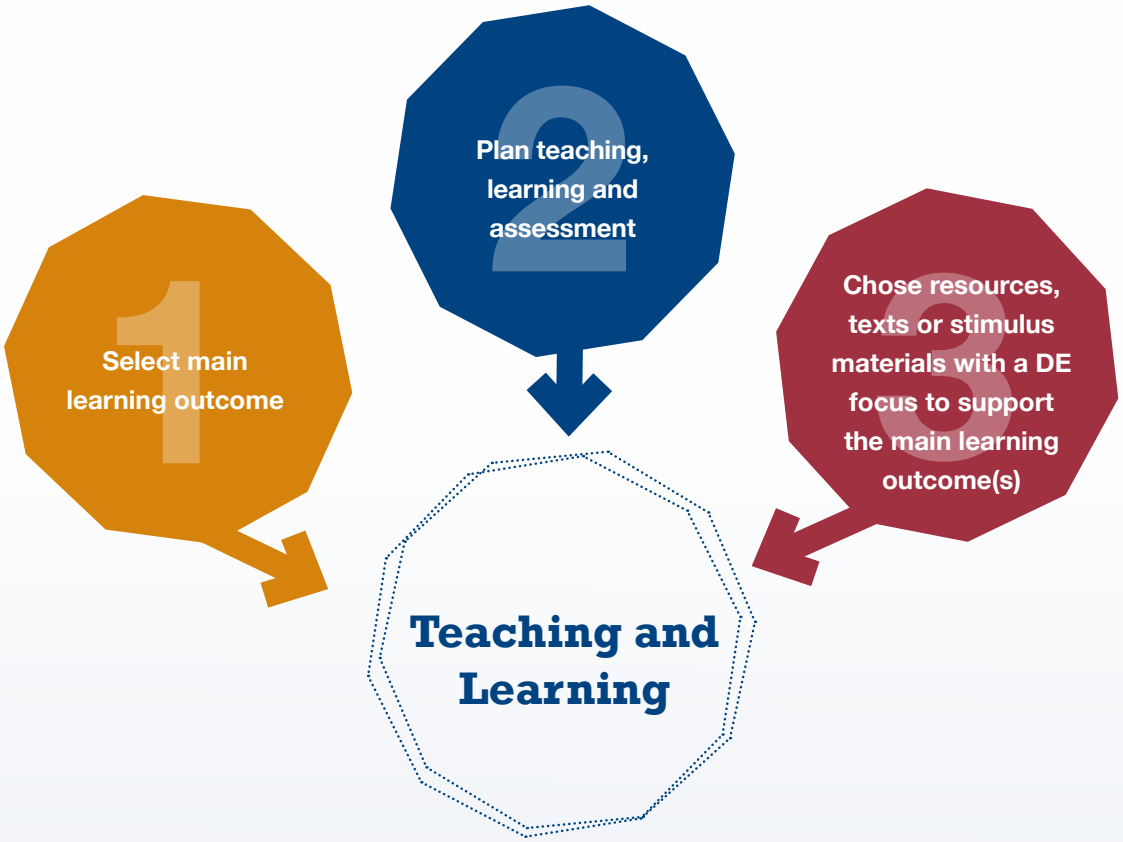


Figure 1

DE and Junior Cycle Science

For the purposes of showing how DE is embedded across the entire subject, this resource exemplifies a cross-section of 10 learning outcomes: one from Strand One (unifying strand); and, 9 from the four contextual strands (i.e. Strands Two-Five), and representing three of the four cross-cutting strand elements (i.e. Systems and interactions, Energy and Sustainability).

All the learning outcomes from the Sustainability strand elements of the specification are **explicitly DE** in terms of the themes addressed, however, this resource focuses on Earth and Space: LOs 7 & 8; Chemical World: LO 10; Physical World: LO 8; and, Biological World: LO 10.

Nature of science: LO 10, which deals with the important relationship and connectedness between science and scientists to society, is included as the sample Strand One learning outcome. However, it is worth highlighting that given the fundamental concern of DE with the wellbeing of our global society, and in keeping with the unifying nature of Nature of Science, relevant Strand One learning outcomes are identified in all the activities suggested in this resource.

Earth and Space: LO 6 (research different energy sources: formulate and communicate an informed view of ways that current and future energy needs on Earth can be met) is included as an example of a junior cycle Science learning outcome which addresses DE themes in a less obvious way, but can be interpreted and taught using DE themes and methodologies.

The inclusion of Physical World: LO 4 (research and discuss a technological application of physics in terms of scientific, societal and environmental impact), and Biological World: LO 5 (conduct a habitat study; research and investigate the adaptation, competition and interdependence of organisms within specific habitats and communities) demonstrate how learning outcomes with no obvious link to DE issues can be achieved through a DE lens.

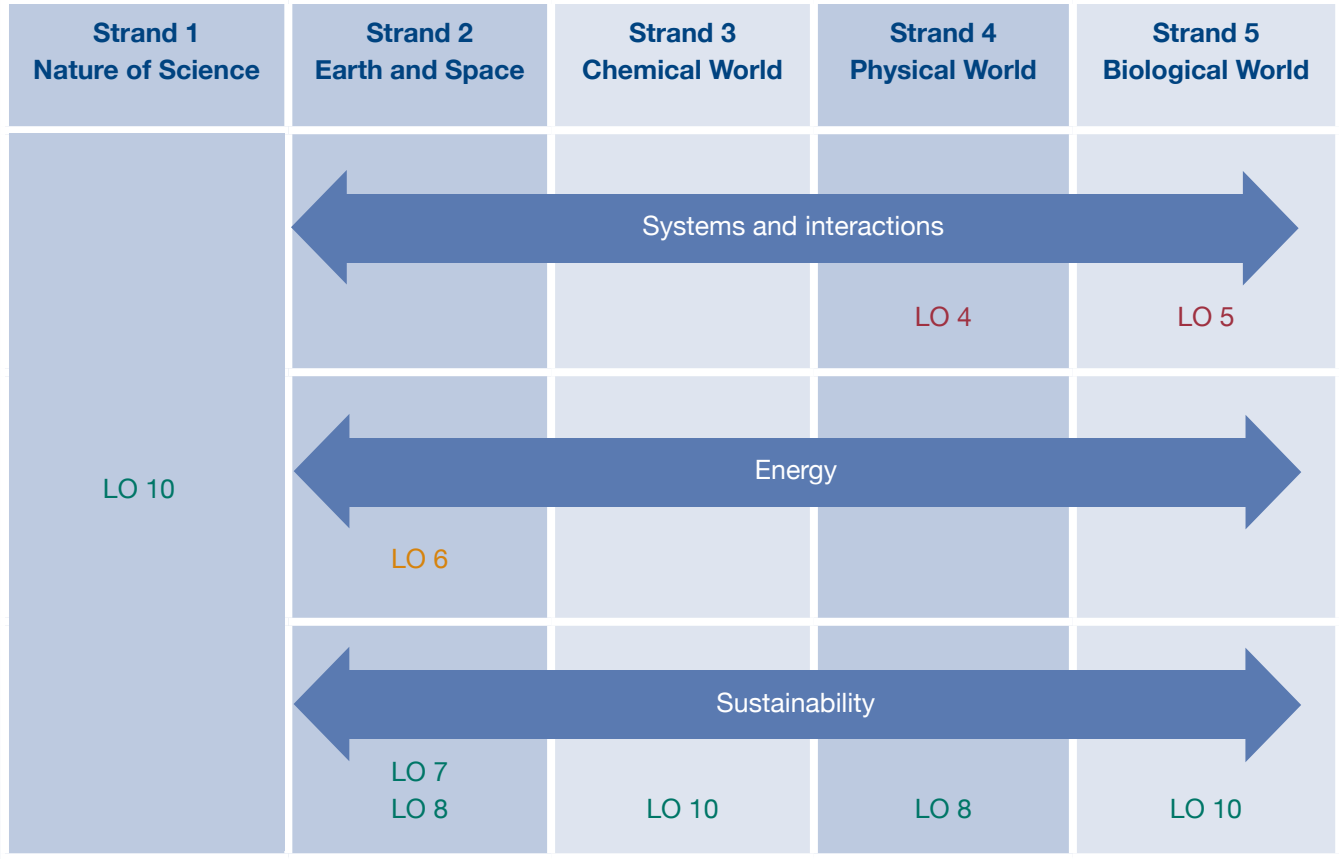


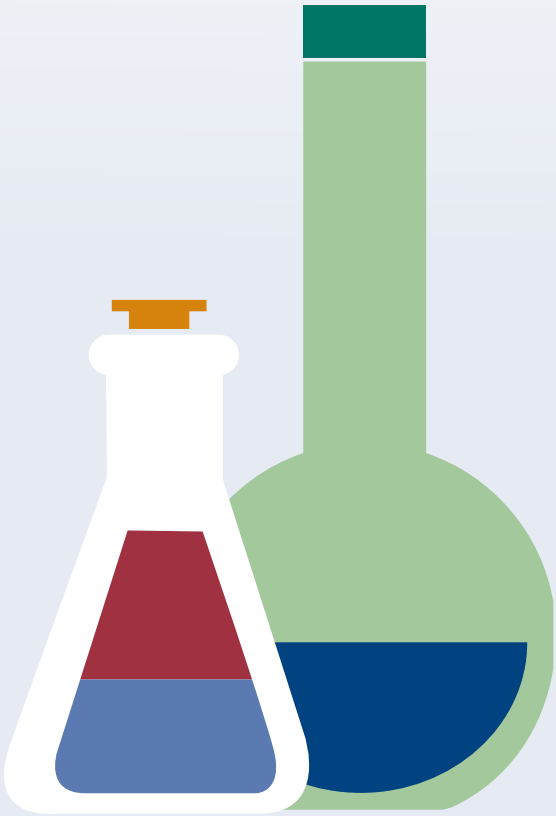
Figure 2

Please note that this resource does not explicitly focus on learning outcomes from the 'Building blocks' element. Building blocks learning outcomes deal with the essential scientific ideas that underpin each strand, and are implicitly addressed in many of the activities outlined in this resource.

Resource structure

In the following pages the learning outcomes identified in Figure 2 above are presented with background information, ideas for activities in the classroom and beyond, and useful links with additional information to support teaching, learning and assessment.

There is a 'Thinking about Global Goals' heading in each section, referencing one or more of the United Nations (UN) Global Goals for Sustainable Development. These are a universal set of goals, targets and indicators that UN member states, including Ireland, will be expected to use to frame their agendas and policies until 2030. The Global Goals follow, and expand on, the Millennium Development Goals (MDGs), which concluded at the end of 2015. As Science teachers, you will find the Global Goals very useful in terms of ensuring that your students fully understand the breadth of the concepts of interdependence and sustainability, and the relevance that these have for developing their 'ability to engage with science-related issues, and with the ideas of science, as a reflective citizen' (NCCA, Specification for Junior Cycle Science, page 9).



Assessment

Many of the teaching and learning activities outlined in this resource support ongoing and summative assessment tasks, with opportunities for self- and peer-assessment, as well as opportunities for teachers to give feedback to individual learners.

Doing DE in junior cycle Science also lends itself to the completion of Classroom-Based Assessment Tasks. For example, for completion of Classroom-Based Assessment (CBA) 1: Extended Experimental Investigation (EEI), learners will formulate a scientific hypothesis, plan and conduct an experimental investigation to test their hypotheses, generate and analyse primary data, and reflect on the process. You might decide to facilitate your students to focus their experimental investigation on one of the Societal Challenges outlined in the EU Horizon 2020 programme:

- Health, demographic change and wellbeing;
- Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy;
- Secure, clean and efficient energy;
- Smart, green and integrated transport;
- Climate action, environment, resource efficiency and raw materials;
- Europe in a changing world - inclusive, innovative and reflective societies;
- Secure societies - protecting freedom and security of Europe and its citizens.

See: **europa.eu/programmes/horizon2020/en**

For Classroom-Based Assessment (CBA) 2: Science in Society investigation, students research a socio-scientific issue, analyse data, and evaluate different perspectives and draw evidence-based conclusions. The openness of this CBA provides plenty of scope to support learners who are interested in DE issues or might like to investigate and report on the contribution of science and scientists to the progress of one or more of the United Nations Global Goals for Sustainable Development. Engagement with investigations which have a sustainability focus will facilitate students who wish to present this CBA for awards such as the Science for Development Award at the Annual BT Young Scientist and Technology Exhibition, or Young Environmentalist Award.


DMATIC PASSPORT


14 LIFE BELOW WATER

STRAND ONE: NATURE OF SCIENCE

STRAND ELEMENT: SCIENCE IN SOCIETY

Main Learning Outcome = 10

Students should be able to 'appreciate the role of science in society; and its personal, social and global importance; and how society influences scientific research'.

Background Information:

Science is a public good and is critical in developing real-world solutions for global challenges, such as ensuring energy, water and food security, or health in a sustainable world with a predicted nine billion inhabitants. Some global challenges, like environmental threats to human health, are well-known (e.g. the damaging effects of air pollution). Other health threats appear suddenly (e.g. the Ebola Virus Disease – EVD), causing untold physical, psychological and economic damage, and sparking new scientific research and development.

One of the first known Ebola outbreaks happened in the Democratic Republic of the Congo near the River Ebola. The virus can be transmitted to humans from infected wild animals (fruit bats, monkeys and apes), and then spreads via human-to-human transmission. Ebola symptoms include the sudden onset of fever, fatigue, muscle pain, headache and sore throat. This is followed by vomiting, diarrhoea, rash, symptoms of impaired kidney and liver function, and in some cases, internal and/or external bleeding. People remain infectious so long as their blood contains the virus (2-21 days).

The World Health Organization (WHO) reported 28,646 cases of Ebola, including 11,323 deaths, between March 2014 and March 2016. The worst affected countries in this latest outbreak were Sierra Leone, Liberia and Guinea. These three countries have very weak health systems, lack basic infrastructure and have recently emerged from long periods of conflict and instability – all factors affecting human health in the region.

Scientific researchers have genetically traced the Ebola virus in these 3 countries. Tracing the genetic lineages of Ebola may help researchers better understand the spread and evolution of the virus and help control outbreaks in the future. Scientists are also working on an Ebola vaccine. Clinical trials for several candidate vaccines are ongoing, but it is hoped that a safe and effective vaccine will be available shortly. Improved 'rapid diagnostic tests' to be used in mobile labs to quickly tell whether people have contracted Ebola, so that they can be treated and/or isolated to prevent further spread, are the focus of further scientific research and development.

When science responds to the needs and interests of the societies in which it takes place, like in the case of Ebola, the consequences often include societal benefits (fewer cases and improved chances of survival) together with improved scientific understanding (for example, of viruses and vaccines). It is important to remember, however, that many life-saving scientific discoveries and advances never reach the poorest people most in need of them (e.g. in treating cases of TB and smallpox). For example, current levels of maternal mortality are unacceptably high: 830 women die every day from preventable causes related to pregnancy and childbirth. 99% of these cases occur in developing countries, primarily due to infection or lack of access to obstetric care.

Thinking about Global Goals:

By 2030 …
Ensure healthy lives and promote well-being for all at all ages (Goal 3)

Teaching and learning activities:

Science in stories – pair, square and share
In pairs, read an Ebola survivor story (link below). Find references to the role that science and technology played in the story. Join with another pair, discuss and come up with a shared list of references. Links to Nature of science: LO 6; Biological world: LO 6

Disease detectives
In your small group research one of the following early scientists: Louis Pasteur (1822-1895), Patrick Manson (1844-1922), Charles Louis Alphones Laveran (1845-1922), Ronald Ross (1857-1932), Camillo Golgi (1843-1926) or Battista Grassi (1854-1925). Discover what disease they all helped to cure. Create a timeline (on paper or via role play) describing the highlights of their work in this field. Links to Nature of science: LOs 1 & 9; Biological world: LO 6

Role of science
Create an animated video explaining the important role that science can play in providing real-world solutions to global health risks, e.g. diseases like malaria or HIV/Aids or the human health impact of alcohol intake, diet and physical activity. Links to Nature of science: LO 7; Biological world: LO 6

Citizen scientist
Use your own words to describe a health issue in society that you are concerned about. List the things that you think are causing this issue. Create a table of possible solutions that you and others can get involved in. Try out one (or more) of these solutions. Keep a record of what happens, and reflect upon and evaluate this process. Links to Nature of science: LOs 2 & 5; Biological world: LO 6.

Useful Links:

- Understanding Science - Science and Society, UC Museum of Palaeontology of the University of California at Berkeley: **undsci.berkeley.edu/article/scienceandsociety_01**

Science in stories – pair, square and share

- Stories of Ebola survivors, World Health Organization: **who.int/features/2014/ebola-survivor-stories/en/**

Disease Detectives

- About Malaria, Centres for Disease Control and Prevention: **cdc.gov/malaria/about/index.html**
- The Malaria Project: A teaching kit for high schools, European Molecular Biology Lab: **scitech.web.cern.ch/scitech/Schools/TheMalariaProject.pdf**

Role of Science

- Free online animated video maker: **powtoon.com**

STRAND TWO: EARTH AND SPACE

STRAND ELEMENT: ENERGY

Main Learning Outcome = 6

Students should be able to 'research different energy sources; formulate and communicate an informed view of ways that current and future energy needs on Earth can be met'.

Background Information:

Renewable energy sources

Renewable energy sources are sources that will never be used up. Examples include wind, solar, hydroelectric, biomass (renewable if the crops are replanted) and tidal (wave).

Non-renewable energy sources

Non-renewable energy sources will not be regenerated in our lifetime. These energy sources are formed over millions of years. Plants and animals die, but their remains still have chemic energy. They are buried and preserved, and over a very long period, the remains are turned into gas, oil, peat and coal. Because these types of fuel are made up of the remains of plants and animals they are called 'fossil fuels'.

The nuclear energy debate

There is lots of debate about nuclear energy. In 1968 the Irish government proposed building a nuclear power plant in Carnsore Point, Co Wexford, but the proposal was dropped because of public opposition. Some of the arguments against nuclear power come from concerns about the safety of nuclear energy, especially in the aftermath of nuclear accidents that released cancer-causing radioactivity into the atmosphere, such as in Three Mile Island (Pennsylvania, USA - 1979), Chernobyl (Pripyat, Ukraine - 1986) and Fukushima (Japan - 2011). The mining of uranium is a cause of concern because of pollution levels at the mine sites; as is the safe storage and lack of environmentally sound ways of disposing of the radioactive waste produced during the process of nuclear fission. There is debate about whether nuclear energy is a renewable or non-renewable source. Those that say it is renewable argue that nuclear power plants have very low carbon emissions, and the small amount of uranium used in nuclear fission means that it can be classified as renewable. People that argue that nuclear power is non-renewable believe that uranium deposits on earth are finite, and to be counted as renewable there would need to be enough uranium available to last forever.

Sustainable energy usage

In a sustainable world, everyone would rely mainly on renewable energy sources, and energy usage would be efficient and clean. There would be little or no environmental damage (i.e. carbon emissions leading to climate change, and acid rain). Sustainable energy also implies affordable energy, all for households, schools, businesses etc.

Thinking about Global Goals:

By 2030 …

ensure access to affordable, reliable, sustainable and modern energy for all (Goal 7)

Teaching and learning activities:

Energy Audit

Track energy usage in your home or school over the course of a month, e.g. checking energy bills, meter readings or using energy monitors. Create a graph to visually represent energy usage data, and present at least 3 ways to personally reduce your energy usage. Links to Nature of science: LOs 4 & 7

Jigsaw teaching

In small groups research one of the following energy sources: solar, wind, wave, nuclear, hydroelectricity, biomass (wood, willow, rapeseed) or fossil fuels (coal, gas, oil and peat). Focus on: formulating a definition/explanation of your energy source, finding an image representing this energy source, giving 3 examples of how this energy source is used, arguing the pros and cons of this type of energy usage, and making recommendations regarding current and future use. Once you have developed expertise on your energy source, agree how you are going to teach your classmates what you know. Rearrange the class so that there is now at least one 'expert' on each energy source in each group. Teach your classmates what you know. Links to Nature of science: LOs 6 & 7

Extension activity:

Carry out one or more of the experiments on renewable and non-renewable energy sources available on the SEAI website (link below).

Crude comparison

Research the amounts of crude oil produced by the top 10 oil-producing countries, and compare this list to the top 10 consumers of crude oil. Reference your findings in a class discussion about the economic, societal and environmental challenges associated with transporting oil around the world. Links to Nature of science: LOs 6 & 7

Making a case for us

Find an online infographic about energy usage in Ireland. Formulate an opinion about Ireland's energy usage and share it with others on a social media platform (e.g. Snapchat, Instagram, Facebook, Twitter etc). Links to Nature of science: LOs 4 & 7

Useful Links:

- Department of Communications, Energy & Natural Resources: **dcenr.gov.ie/energy/en-ie/Pages/home.aspx**
- The big energy debate series, The Guardian: **theguardian.com/big-energy-debate**
- Ted Talk by Michael Shellenberger (2016), 'How fear of nuclear power is hurting the environment': **ted.com** (video – 14 mins)

Energy Audit

- Energy in Education: Promoting energy efficiency in schools: **energyineducation.ie/Energy_In_Education/**

Jigsaw teaching

- SEAI – Sustainable Energy Authority of Ireland: **seai.ie/Schools/Post_Primary/**

Making a case for us

- Ireland's energy infographic: **irishtimes.com/news/environment/ireland-s-energy-infographic-1.2111394**
- SEAI 'Energy in Ireland 2014' infographic: **seai.ie/Publications/Statistics_Publications/Energy_in_Ireland/Energy-in-Ireland-Infographic-2014.pdf**

STRAND TWO: EARTH AND SPACE

STRAND ELEMENT: SUSTAINABILITY

Main Learning Outcome = 7

Students should be able to 'illustrate how earth processes and human factors influence the Earth's climate, evaluate effects of climate change and initiatives that attempt to address those effects'.

Background Information:

The earth's temperature depends on the balance between energy entering and leaving the planet's system. When incoming energy from the sun is absorbed, earth warms. When the sun's energy is reflected into space, the earth avoids warming. When absorbed energy is released back into space, the earth cools. Climate changes prior to the Industrial Revolution in the 1700s can be explained by natural causes, such as changes in solar energy, volcanic eruptions, and natural changes in greenhouse gas concentrations (level of carbon dioxide in the earth's atmosphere). Scientific research has shown that that human activities (e.g. increased production/consumption, deforestation and burning of fossil fuels) is the dominant cause of our current climate change.

Climate change is evident in changing weather patterns, such as flooding and droughts. If unchecked this will lead to increased levels of human migration and forced displacement, more cases of diseases like malaria, more wildfires, greater scarcity of water, more extreme weather (hurricanes and floods), loss of land mass/small island states because of rising sea levels, loss of biodiversity, and negative effects on food production (e.g. wheat and maize harvests.) These impacts will have a knock-on effect locally, nationally and globally.

Climate change affects people around the world differently, and the most vulnerable people are those who, for the most part, contribute the least to increased carbon dioxide levels. Climate change is not just an economic or environmental issue, it is a justice and human rights issue, and it can only be overcome if the world becomes a more sustainable place.

The Intergovernmental Panel on Climate Change (IPCC) claims that the world is at a 'carbon crossroads'. A focus on sustainability, because it is less harmful to our ecosystems, can help in the fight against climate change. Sustainability will also help meet the needs of the poor and most vulnerable, now and in the future. In recognition of this fact, Ireland was one of 193 countries to sign up to the United Nations (UN) Global Goals for Sustainable Development. Additionally, 188 countries agreed, at the COP21 conference in Paris in December 2015, to reduce greenhouse gas emissions and limit the rise in global temperature to 1.5-2 degrees Celsius.

Thinking about Global Goals:

By 2030 …
Take urgent action to combat climate change and its impacts (Goal 13)

Teaching and learning activities:

Bottling it

Carry out an experiment to recreate the greenhouse effect using plastic bottles and bags, rubber bands and thermometers (see link below for instructions). Links to Nature of science: LO 3

Making connections

Create a set of cards, with images, one for each of the following statements:

- The earth warms up, causing global warming, leading to climate change.
- Turn on a light switch.
- Most power stations make electricity by burning fossil fuels.
- CO2 is a gas found in the atmosphere. It helps form an 'invisible blanket' that keeps the earth warm by trapping heat.
- Warmer weather is causing extreme weather events.
- Lights use electricity which is supplied by power stations.
- Land ice and glaciers melt and flow into seas, adding to rising water levels.
- The more CO2 produced, the more heat gets trapped in the atmosphere.
- Warmer weather causes sea temperatures to rise. The water molecules expand adding to rising sea levels.
- Burning fossil fuels creates CO2. This goes into the air and some of it stays there.
- Heat comes off the sun. It bounces off the earth but gets trapped in the 'invisible blanket'.
- Sea levels rise, and the flooding of nearby land leads to an internal displacement of people.

Sequence the cards in order, demonstrating how turning on a light switch is connected to the displacement of people. [Adapted from Actionaid Powerdown toolkit]
Links to Nature of science: LO 4

A drop in the ocean?

How does climate change affect people in Ireland, and where do we fit in the global picture? Globally, which countries and people are most seriously affected by the impacts of climate change (i.e. island nations and smallholder farmers)? Organize a screening of 'Drop in the Ocean?', a documentary including interviews with Ireland's leading environmental scientists, writers and activists (see link below). Links to Nature of science: LO 6

Useful Links:

Ted Talks : ted.com

- Alice Bows-Larkin (2015), 'Climate Change is happening. Here's how we adapt' (video–14.23 mins)
- Al Gore (2016), 'The case for optimism on climate change' (video–25.20 mins)

Irish news and actions to address climate change: **stopclimatechaos.ie**

Bottling it

- Greenschools Programme: Climate change lesson plan: **greenschoolsireland.org/_fileupload/Water%20Lesson%20Plans%2015_16/Secondary/Lesson%20Plan%20for%20Climate%20Change.pdf**

A drop in the ocean?

- 28-minute documentary: **trocaire.org/getinvolved/climate-justice/drop**
- Trocaire (2016) Climate Change Climate Justice 2 –
  Classroom resources linking climate change and forced displacement of people:
  trocaire.org/sites/trocaire/files/education/lent2016/post-primary-teacher-resource.pdf

STRAND TWO: EARTH AND SPACE

STRAND ELEMENT: SUSTAINABILITY

Main Learning Outcome = 8

Students should be able to 'examine some of the current hazards and benefits of space exploration and discuss the future role and implications of space exploration in society'.

Background Information:

The early days of space exploration were driven by the wish to be the first: the first country to successfully orbit the earth, to send a person into space, to land a person on the moon. This 'space race' resulted in many launches, particularly of military reconnaissance and communications satellites. Nowadays, space exploration is largely driven by commercial and scientific communities.

There have been some infamous space-related accidents, for example, the 1967 Apollo 1 mission which resulted in 3 deaths; the 1986 Space Shuttle Challenger explosion which killed all 7 astronauts on board; the 2003 Space Shuttle Columbia which burned up on re-entry to the earth's atmosphere, killing all 7 on board. Astronauts are closely monitored for physical or psychological damage resulting from their time in space. Another hazard of space exploration is the 500,000 plus pieces of manmade debris, or "space junk," orbiting the earth. Even if no further debris was left in space, the amount of junk will increase exponentially over time as the existing debris collides and breaks apart. The European Space Agency and NASA agree that space debris represents the greatest challenge to future space exploration, because even the smallest, untraceable speck of litter can cause immense damage to a spacecraft when travelling up to 28,000 mph.

Many of the more innovative technologies that we use on a routine basis were first developed to cater for space exploration. For example, solar panels, developed to generate electricity on the International Space Station and Mir space station, are now seen as a renewable source of energy; and water purification systems, originally developed to recycle the water on space stations, were later adapted to facilitate access to safe clean drinking water in developing countries.

Thinking about Global Goals:

Space exploration and technology are actively supporting progress in relation to the Global Goals for Sustainable Development. For example, the European Space Agency, through its suite of Space for Earth programmes and initiatives uses satellites to: assess the risk of epidemics (Goal 3); support education in rural areas in developing countries (Goal 4); map global air pollution; monitor world heritage sites (Goal 11); monitors ice sheets and desertification (Goal 13); track ocean vessels from space to prevent overfishing (Goal 14); and, track biodiversity (Goal 15).

Teaching and learning activities:

Interdependent Google Earth

The famous Canadian astronaut, Commander Chris Hadfield, described seeing earth from space as it 'roar[ed] silently in colour and texture', 'a self-propelled art gallery'. Send a tweet to Chris Hadfield (@Cmdr_Hadfield), by sharing a Google Earth screenshot of, and a comment about, a place that means something to you (e.g. somewhere you have visited or would like to go, a place connected to your family or someone you know, or somewhere you have heard about in the news). Links to Nature of science: LO 7

Planet B

Stellar astronomer Lucianne Walkowicz works on NASA's Kepler mission, searching for places in the universe that could support life. Watch her Ted Talk, where she suggests that we need to start thinking of planetary exploration and preservation of the Earth as two sides of the same goal (see link below). Use what you hear in the talk to inform a class discussion about ex-UN General Secretary Ban Ki-moon's statement that "We don't have any 'plan B' for addressing climate change because we don't have any 'planet B'." Links to Nature of science: LOs 6, 7, 8 & 10

Space junk

Do an input at an assembly, using a digital tool, like Minecraft or Prezi, to raise awareness about the hazards of space debris, highlighting the implications for future space exploration. Links to Nature of science: LO 7

Living in the Space Age

In small groups research one or more space invention with the potential to improve the lives of people on earth: e.g., battery technology; artificial limbs; freeze drying technology; enriched baby food; water purification; solar energy systems; or, satellite technology to respond to humanitarian disasters, forecast weather and carry out environmental monitoring. Use Padlet (link below) to populate a class topic summary about beneficial space inventions. Share the final Padlet image on the school website, or in another appropriate public forum, as a way of generating a wider discussion about the future of space exploration. Links to Nature of science: LOs 6, 7 & 10

Useful Links:

- Peering into space – Ted radio hour (2013): **npr.org/2013/02/15/172136499/peering-into-space**
- Space for Educators website: **esa.int/Education**
- Scoilnet resources on for teachers: **scoilnet.ie/post-primary/collections/science/**

Google Earth

- Google Earth tutorial: **google.com/earth/learn/beginner.html#tab=sharing-google-earth-screenshots**
- Ted Talk by Chris Hadfield (2014) 'What I learned from going blind in space': **ted.com** (video–18.18 mins)
- Global Goals - Radio Everyone, 'Samantha in Space,' astronaut Samantha Cristoforetti presents music, songs and interviews connected to space (60 mins): **globalgoals.org/radio-everyone/**

Planet B

- Ted Talk by Lucianne Walkowicz (2015), 'Let's not use Mars as a back-up planet': **ted.com** (video–5.50 mins)
- Interview with ex-UN Gen. Secretary Ban Ki-moon where he states 'there is no planet b': **euronews.com/2016/06/18/interview-with-un-secretary-general-ban-ki-moon/**
- Hawaii Space Exploration Analog and Simulation: **hi-seas.org**

Space junk

- European Space Agency, 'Space debris problem': **youtube.com/watch?v=9cd0-4qOvb0** (video–16 mins)
- Litter in space: **theguardian.com/science/2010/aug/22/pollution-litter-space-edde-darpa**
- Minecraft Education Edition: **education.minecraft.net/**
- Prezi for educators: **prezi.com/prezi-for-education/**

Living in the Space Age

- Padlet - a virtual wall for content sharing (images, videos, text): **padlet.com**

STRAND THREE: CHEMICAL WORLD

STRAND ELEMENT: SUSTAINABILITY

Main Learning Outcome = 10

Students should be able to 'evaluate how humans contribute to sustainability through extraction, use, disposal, and recycling of materials'.

Background Information:

All plastics are man-made synthetic polymers. A polymer is a large chain-like molecule consisting of many repeated and linked units. They are both naturally occurring and synthetic. Examples of natural polymeric materials are wool, rubber, cotton and silk. The basic unit of polymers can be made of carbon, hydrogen, oxygen, and/or silicon. The polymers in plastic are derived from fossil fuels. It takes 162g of oil (non-renewable) and 7 litres of water to manufacture a one-litre plastic bottle, creating over 100g of greenhouse gas emissions (10 balloons full of CO2) per empty bottle.

There are many environmental implications of plastic, given that the raw material is fossil-fuel based, the energy required in manufacturing the product can be high and it ultimately becomes a significant source of landfill and ocean waste. The best way of being sustainable in relation to plastic products is to reduce consumption, because this would mean less fossil fuels (oil) and water usage, less waste in landfill leaching into the ground and in the waterways (negatively impacting biodiversity) and ultimately damaging human health, livelihood security and wellbeing.

In Ireland, a plastic bag levy of 15c per bag was first introduced on 4 March 2002. Its primary purpose is to reduce the consumption of disposable plastic bags by influencing consumer behaviour. The levy had an immediate effect, with a decrease in plastic bag usage from an estimated 328 bags per capita to 21 bags per capita. The current levy of 22 cent was introduced on 1 July 2007. This increase was implemented because by 2006 consumption of bags per capita increased to 31 per capita. Currently usage is estimated at less than 14 bags per capita.

Another way to be sustainable is to dramatically reduce our use of plastic products in the first place - for example, by replacing personal plastic water bottles with stainless steel alternatives. Recycling any plastic that we do use is also important: recycling one tonne of plastic bottles saves 3.8 barrels of oil. It also saves 7.4 cubic yards of landfill space. Plastic containers, if recycled correctly, can be turned into new products. For example softer plastics (PET) can be used in creating fibres for your clothes, upholstery and carpet; and harder plastics (HDPE) into studier products like plastic furniture, roadside curbs and truck cargo liners.

Thinking about Global Goals:

By 2030 …
Ensure sustainable consumption and production patterns (Goal 12)
Take urgent action to combat climate change and its impacts (Goal 13)

Teaching and learning activities:

Usage per capita

Develop and administer a simple questionnaire about plastic bag usage and attitudes to the plastic bag levy. Analyse and display findings using a graph. Links to Nature of science: LOs 3, 4, & 7

Life cycle of a plastic bottle

Divide into three groups, called bottle 1, bottle 2 and bottle 3. Watch Emma Bryce's animated video (link below). In your group produce a visual representation (e.g. using flipchart sheets and markers or a digital tool) of the life cycle of your respective bottle. Links to Nature of science: LO 7

Sailing Past Plastic

Listen to Annie Leonard, from the Story of Stuff Project, and Stiv Wilson, an activist from an organization called '5 Gyres', talk about plastic pollution in oceans, lakes and rivers (link below). Links to Nature of science: LO 6

Plastic Fantastic

Contribute to sustainability by working in small groups to design, make, review and reflect upon a science-related product from waste plastic, for example, a water wall, bird feeder or planters, a rain gauge or model solar system made from plastic bottles/lids. Links to Nature of science: LOs 3 & 5.

Extension Action:

Place a suggestion box near the school reception area (or develop an online suggestion box), and invite everyone in the school to come up with ideas about how to become a plastic-free school. Create and display a set of awareness raising posters about the lifecycle of plastic and its impact on the environment, including the best suggestion box ideas.

Useful Links:

- Materials for a Sustainable Future – education resources: **materialsfuture.eu/media/220815/materials-future-education-resource-english.pdf**
- Practical Action Plastics Challenge (STEM), includes PowerPoints and lesson plans: **practicalaction.org/plastics-challenge**

Lifecycle of a plastic bottle

- Emma Bryce, 'The lifecycle of a plastic bottle': **ed.ted.com** (animated video–4.07 mins)
- Dianna Cohen (2010), 'Tough truths about plastic pollution': **ted.com** (video–5.18 mins)

Sailing Past Plastic

- The Story of Stuff Project, 'Episode 18 - Sailing Past Plastic': **storyofstuff.org/podcasts/sailing-past-plastic/** (podcast–25.21 mins)
- Charles Moore (2009), 'Seas of Plastic': **ted.com** (video–7.16 mins)

Plastic Fantastic

- Search Pinterest for science related ideas made from plastic waste: **pinterest.com**

STRAND FOUR: PHYSICAL WORLD

STRAND ELEMENT: SYSTEMS AND INTERACTIONS

Main Learning Outcome = 4

Students should be able to 'research and discuss a technological application of physics in terms of scientific, societal and environmental impact'.

Background Information:

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material, usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal.

The transistor is the fundamental building block of modern electronic devices. It was invented in 1947 by American physicists John Bardeen, Walter Brattain, and William Shockley. The transistor revolutionized the field of electronics, and paved the way for smaller and cheaper radios, calculators, and computers, among other things. The transistor is on the list of IEEE milestones in electronics, and Bardeen, Brattain, and Shockley shared the 1956 Nobel Prize in Physics for their achievement.

Radio has the power to give farmers in developing countries the information they need to make their land more productive and raise livestock more effectively. Radio is still the primary communication tool in Africa, reaching between 70%-90% of people across sub-Saharan Africa, making broadcasting the most effective way of conveying vital information.

Established in 1979, Farm Radio International (link below) is an initiative that operates across 38 African countries, and serves the interests of small-scale farmers and their communities. Kibaale Kagadi Community Radio (KKCR) is one of the 560 radio station partners involved in Farm Radio International. KKCR airs programmes that provide information to farmers about availability and access to seed, field preparation and planting a strain of maize called Longe 5. Longe 5 is a nutritious climate smart crop that can improve farming incomes and the health of farming communities. Freeplay Energy (link below) is a company that produces sturdy solar/dynamo-powered radios for communities living off the power grid in rural locations. These radios mean farmers can access information without mains power supplies or costly/polluting disposable batteries.

Thinking about Global Goals:

By 2030 …
Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation (Goal 9)
Strengthen the means of implementation and revitalise the global partnership for sustainable development (Goal 17)

Teaching and learning activities:

Radio Africa

Review a programme broadcast on an African radio station or an Irish radio programme about subsistence farming in Ethiopia and Malawi (links below). Links to Nature of science: LOs 6, 8 & 10

Recording Impact

Carry out more research about the role of radio in communicating information to small-scale farming communities in the developing countries.

Role play an interview between a group of farmers in Uganda and a KKCR radio presenter. The interview should focus on the impact of radio broadcasts on families in the community and on the local environment.

Use a free online voice recorder, like Vocaroo, to record and share the role play with a wider audience.

Links to Nature of science: LOs 6, 7, 9 & 10

Intercom Imagination

Air an advert about solar/dynamo powered radios on your school intercom. The advert should include a short explanation about the physics of these types of radios and a callout to listeners to take some time to imagine the environmental impact if everyone in the world used these radios.

Links to Nature of science: LO 7 & 10

Useful Links:

- PBS 'Transistorized!,' website on the science and history of the transistor, includes instructions about how to recreate the first transistor: **pbs.org/transistor/**
- PBS History Detectives (2012), 'Early transistor radio': **pbs.org/video/2285052239/** (video–12.34 mins)

Radio Africa

- Download an African radio station app at: **tunein.com/radio/Africa-r101215/**
- Fergal Keane (2011), 'One World: The future of food', RTE 1 Documentary on One: **rte.ie/radio1/doconone/2011/0802/646852-radio-documentary-one-world-ethiopia-malawi-food/** (radio documentary–51.05 mins)

Recording impact

- Farm Radio International: **farmradio.org**
- Lifeline Energy – a not-for-profit organization that runs solar/dynamo radio projects in sub-Saharan Africa: **lifelineenergy.org/**
- Free online voice recording apps: **vocaroo.com**; **voicespice.com**

Intercom Imagination

- Freeplay Energy: **freeplayenergy.com**

STRAND FOUR: PHYSICAL WORLD

STRAND ELEMENT: SUSTAINABILITY

Main Learning Outcome = 8

Students should be able to 'research and discuss the ethical and sustainability issues that arise from our generation and consumption of electricity'.

Background Information:

Generation

Up to 75% of the electricity generated in Ireland depends on fossil fuels (mainly gas), much of which is imported. This means that Ireland is not energy secure – the fossil fuel that we rely on is running out, and the supplies that remain are subject to fluctuating prices. Climate change, caused by the burning of fossil fuels, has the potential to disrupt supply and increase demand. For this reason, Ireland has a target for electricity generated from renewable energy of 42% by 2020. Households, communities and businesses can contribute to this target by switching to ethical and green electricity providers where possible.

Consumption

All houses in Ireland, whether rented or sold, must have a Building Energy Rating (BER) certificate. The BER tells you the energy efficiency level of the building and is calculated based on the construction materials used and the methods used to heat the hot water and the house. The rating is given on a scale from A1 (very energy efficient) to G (very inefficient). Most Irish houses are in the C and D category. Home electricity use accounts for approximately one third of Ireland's total electricity use.

Energy labelling of appliances was first introduced in 1995 under EU legislation. The legislation currently covers washers, dryers, combination washer dryers, fridges, freezers, fridge-freezers, dishwashers, ovens, air conditioners and lighting. Appliances are labelled A-G, with A being the most efficient. Energy efficient appliances will save you money on your energy bill and are less harmful to the environment. When it is necessary to purchase new items, our decision to choose energy efficient products will encourage manufacturers to produce more in this category. In this way, exercising your purchasing power and making the smart choice can have a real and significant impact – not only on your own energy bills and on the types of appliances we will have in the future, but also in terms of sustainable electricity consumption and action against climate change.

It is important to use electricity efficiently to reduce energy wastage and environmental harm. For example, when washing clothes or dishes, set the washing machine or dishwasher to the lowest water temperature required; don't let frost build up in the freezer compartment of the fridge as this increases energy consumption; don't open the oven door to check cooking - every time you do so you lose 20% of the accumulated heat; take a shower rather than a bath - a typical shower uses only one fifth of the energy of a full bath. Taking steps like these will save money off electricity bills, lessen the need for imported fossil fuels, and help reduce the unnecessary emission of CO_2 and other pollutants. In the long-term, we can look to examples of electricity-free lifestyles in an effort to reduce our collective consumption levels - for example, through the use of solar energy, which is widespread in many developing countries.

Thinking about Global Goals:

By 2030 …
Ensure access to affordable, reliable, sustainable and modern energy for all (Goal 7)
Make cities and human settlements inclusive, safe, resilient and sustainable (Goal 11)
Ensure sustainable consumption and production patterns (Goal 12)

Teaching and learning activities:

Make a list, and check it twice

Make a list of the electrical appliances used in school and at home, note the energy rating in each case. If possible, use a wattmeter to measure the energy use of the applications in use and in 'stand by' mode. Use this data as the basis for a discussion about the ethical and sustainable issues arising from our daily consumption of electricity. Links to Nature of science: LOs 3, 4 & 7

BER survey

Carry out a survey to discover the average Building Energy Rating (BER) for the homes of people in your class, year or school community. Links to Nature of science: LO 3

Causes, effects and solutions

Create a leaflet or poster targeting young people, to raise awareness about the causes, effects of, and solutions to, the challenges associated with electricity generation and consumption.
Links to Nature of science: LOs 4 & 7

Extension Action

Earth Hour is a worldwide grassroots movement uniting people to protect the planet, and is organised by World Wildlife Federation (WWF). Earth Hour is held at the end of March. It encourages individuals, communities, households and businesses to turn off their non-essential lights for one hour. Organize an Earth Hour event or action in your school or community.

Useful Links:

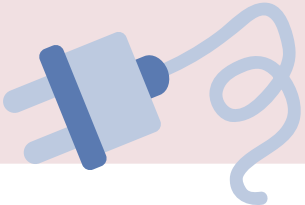
- Department of Communications, Energy and Natural Resources: **dcenr.gov.ie**
- Sustainable Energy Authority of Ireland (SEAI), post-primary section: **seai.ie/Schools/Post_Primary/**
- BBC GCSE Bitesize – Science – Electricity: **bbc.co.uk/schools/gcsebitesize/science/add_aqa/electricity/**

Make a list, and check it twice

- Greenschools Programme - Appliance Audit: **greenschoolsireland.org/wp-content/uploads/2016/09/Appliance-Audit.pdf**

Extension Action:

Earth hour: **earthhour.org**
Earth day (22 April) toolkit: **earthday.org/earth-day/earth-day-toolkit/**



STRAND FIVE: BIOLOGICAL WORLD

STRAND ELEMENT: SYSTEMS AND INTERACTIONS

Main Learning Outcome = 5

Students should be able to 'conduct a habitat study; research and investigate the adaptation, competition and interdependence of organisms with specific habitats and communities'.

Background Information:

Ecology is an important branch of biology because it helps us to understand how the world works and how humans interact with, and impact upon, our world. Ecologists study habitats, or natural environments, to gather information about the different life forms that live in the particular habitat, understand how the animals and plants have adapted to live in the habitat, discover how human activity impacts on the habitat and identify ways of preventing future habitat loss and damage.

In 2016 the UN's Sustainable Development Goals report stated that human activity was contributing to a decline in worldwide fish stocks, and over 23,000 species of plants, fungi and animals facing extinction. Habitat loss is identified as a main threat to 85% of all species in the IUCN's Red List (a list of species officially classified as "Threatened" and "Endangered"). Forest loss and degradation is mostly caused by the expansion of agricultural land, intensive harvesting of timber, wood for fuel and other forest products, as well as overgrazing. Population growth, urbanization, industrialization and tourism are all factors in the degradation of marine and coastal habitats. Additionally, many countries (including Ireland) rely on ecosystems that are not their own, for food and resources. Raw materials such as coffee, tea, soya, wheat, cotton and coltan are extracted from ecosystems in the developing countries, often on a massive scale, causing environmental degradation. Climate change is also contributing to habitat loss.

Ecosystems are made up of one or more habitats. This means that healthy habitats contribute to maintaining ecological biodiversity, the resource that all people, now and in future generations, depend upon for food, fresh water, medicines, control of climate and disease, crop pollination, and for travel and leisure activities.

Thinking about Global Goals:

By 2030 …

- Conserve and sustainably use the oceans, seas and marine resources for sustainable development (Goal 14)
- Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (Goal 15)

Teaching and learning activities:

Habitat identity card game

Carry out a habitat study, using a key to identify organisms living in the habitat, and note examples of plant and animal adaptation, as well as intraspecific (same species) and interspecific (different species) competition for scarce resources. In pairs create 1-2 habitat identity cards, with the name, image and a brief description (from the key) of the plant or animal in each case, and 1 hint for the each of the following questions: What/who depends on you in your habitat? What/who do you depend upon in your habitat? Once you have finished, move around the classroom making connections between the plant/animal on your card and the cards created by others in the class. Links to Nature of science: LOs 3 & 4

Food web

Draw a food web, or the interconnecting food chains (showing how energy is passed from one organism to another through food), for the habitat you studied.
Links to Nature of science: LO 7

What if…

In small groups consider what would happen to the habitat you studied, and the organisms that live there, if one or more of the following events occurred:

- The land is drained for agriculture
- An alien species invades
- The area is developed for industry or infrastructure (e.g. roads or houses)
- Trees are cut down for fuel
- Climate change leads to increased instances of flooding or drought

Links to Nature of science: LO 5

Extension Action:

- Create a school biodiversity garden with native plants, wildflowers, bug hotels and bird/bat boxes etc. made from natural materials (bark, sticks, leaves, etc), to attract wildlife like bees, butterflies, insects, birds, bats etc.

or

- Organise a tour to a nearby eco-garden/visitor centre (links below).

Useful Links:

- Dublin Zoo junior cycle Ecology module: **dublinzoo.ie/56/Secondary-School-Education.aspx**
- Green schools programme – Habitat mapping outside the school grounds: **greenschoolsireland.org/resources/habitat-mapping-outside-the-school-grounds/**
- BBC Bitesize GCSE Biology – Ecosystems and habitats – learner guides and video clips: **bbc.co.uk/education/topics/zb44jxs**
- Digital Explorer: Coral Ocean Science (11-14 years). Topics include: classification, habitats, adaptation, life cycles, and human impacts on the environment: **oceans.digitalexplorer.com/resources/?collection=coral-oceans-11-14**

Extension Actions:

- An Taisce, 'Growing Change: Designing a school garden' (PowerPoint Presentation): **greenschoolsireland.org/resources/designing-a-school-garden/**
- Sonairte Eco-Garden and Visitor Centre, Laytown, Co Meath: **sonairte.ie**
- An Gairdin Organic Garden and Ecology Centre, Portunma, Co Galway: **angairdin.ie**

STRAND FIVE: BIOLOGICAL WORLD

STRAND ELEMENT: SUSTAINABILITY

Main Learning Outcome = 10

Students should be able to 'evaluate how humans can successfully conserve ecological biodiversity and contribute to global food production. Appreciate the benefits that people obtain from ecosystems'.

Background Information:

There are significant challenges currently facing ecological biodiversity. Globally, we are using 25% more natural resources than the planet can sustain. As a result, species, habitats and local communities are under pressure or direct threat (e.g. from loss of access to fresh water). There are currently more than 7 billion people in the world, but scientists estimate this number will rise to 9 billion by 2050. Climate change is also significantly contributing to reduced levels of biodiversity as well as certain industries are also degrading ecosystems. For example, the widespread use of palm oil in food products and cosmetics is one of the leading causes of tropical forest destruction globally.

As climate change exacerbates food production stresses on ecosystems (e.g. worsening the vulnerability of food supplies to pests and disease), ecosystem degradation and even collapses may become more commonplace, with enormous implications for food security, especially in the developing countries where two billion rural poor depend on ecosystems for sustenance and livelihoods. We therefore need to improve how we grow, transport and consume food. For example, by breeding good quality seed, cultivating bee populations, consuming in-season food, reducing food portions to the recommended healthy size and wasting less food.

There are a range of additional ways for making sure that biodiversity loss is stopped, including: conservation measures, such as reintroduction of native species, habitat restoration (e.g. at mine sites); legal protection (e.g. EU legislation to prevent overfishing); harvest management/replanting (e.g. forests); international agreements (e.g. COP21 – limiting carbon emissions); and, waste management (e.g. at a household or school level focusing on reducing, reusing and recycling).

One method that has proven successful around the work for conserving species and natural habitats is the creation of protected areas. This is especially necessary when the protected area is a biodiversity hotspot. Biodiversity hotspots are among the richest and most important ecosystems in the world — and they are home to many unique and vulnerable populations who are directly dependent on nature to survive. Well-planned and well-managed protected areas can help to safeguard freshwater and food supplies, reduce poverty, and reduce the impacts of natural disasters, thus contributing to the livelihoods and well-being of local communities and society at large.

Thinking about Global Goals:

By 2030 …

Conserve and sustainably use the oceans, seas and marine resources for sustainable development (Goal 14)

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (Goal 15)

Teaching and learning activities:

Hot spot (e)book

Create a biodiversity hot spot (e)book, with case studies of some of the 35 biodiversity hotspots around the world. Each case study should include: a map identifying the geographical location of the hot spot; images of the plant and animal species native to the area; a description of the main dangers to biodiversity in the hot spot; and, a focus on any conservation efforts. Where possible, include references to the people that live in these hot spots (e.g. quotes, images and stories). Present (or email) a copy of your hot spot (e)book to your local library. Links to Nature of science: LOs 4, 6, 7 & 10

Sustainable Food Table

One way to help to conserve ecological biodiversity is to change and improve how we grow, transport and consume food. Watch the YouTube video 'Make #notwasting a way of life' (link below). Complete an ecological footprint calculator (links below). Focus on the food consumption aspect of the calculator, then work in small groups to populate the following table:

Change/improvement	What needs to happen	How can young people help
Growing Food		
Transporting food		
Consuming (buying and disposing of waste) food		

Conservation mindmap

Gorongosa National Park, located in central Mozambique, is part of one of the world's 35 biodiversity hotspots. The famous American biologist who coined the phrase 'biodiversity', E.O. Wilson, said that being in Gorongosa 'fulfilled all the yearnings for adventure and discovery I have felt since my boyhood'. During Mozambique's civil conflict (1977-92) approx. 95% of the wildlife in the park was slaughtered to fund warring groups. Since 2004, the Gorongosa Restoration Project has been working to restore the wildlife and meet the human development needs of the people living in, and dependent, on the park for their survival.

Create a mindmap demonstrating the impact of the conservation work in Gorongosa (link below) on ecological biodiversity in the area, and the benefits to the local people and beyond.

Links to Nature of science: LOs 6, 7 & 10

Extension Actions:

- Organize a 'Make #notwasting a way of life' event in school, for example, an input at a school assembly telling everyone why it is important not to waste food, followed by a 'no waste lunch' week. Check out Food Cloud as practical way of putting waste food back into the system.

or

- Contact the National Parks and Wildlife Service (link below) to find out about the Irish National Parks nearest to you, then organize a visit to learn more about Irish biodiversity and conservation projects.

Useful Links:

- UCD Earth Institute – Ecology and Evolution page: **ucd.ie/earth/research/ecologyevolution/**

Hot spot case studies

- Conservation International: **conservation.org/Pages/default.aspx**
- How to create an eBook with Google slides: **shakeuplearning.com/blog/how-to-create-an-ebook-with-google-slides/**

Sustainable Food Table

- Food and Agricultural Organization of the United Nations (2016) 'Make #notwasting a way of life': **youtu.be/68d-MpURBK8** (video–3.30 mins)

Conservation mindmap

- Gorongosa National Park: **gorongosa.org**
- E.O. Wilson, the great American biologist on Gorongosa National Park: **gorongosa.org/our-story/science** (video–1.46 mins)

Extension Action:

- There are six National Parks in Ireland: Glenveagh, Co. Donegal, Ballycroy, Co. Mayo, Connemara, Co. Galway, the Burren, Co. Clare, the Wicklow Mts. and Killarney, Co. Kerry: **npws.ie/**

Get Active/Get Engaged

Resources to support the teaching and learning of development themes using development education approaches are available from specific non-governmental websites or from platforms such as **developmenteducation.ie**

There are several award programmes open to post-primary students engaged in DE action in the field of Science, the most relevant of which is the **Science for Development Award**, part of the annual **BT Young Scientist and Technology Exhibition**. For more details on this award and to find out how to take part, visit **selfhelpafrica.org/ie/education/**

Additional Science-related award programmes include:

- **WWGS Global Passport Award -** worldwiseschools.ie/wwgs-global-passport/
- **RealLifeScience schools video competition** - reellifescience.com
- **SciFest** - www.scifest.ie
- **Science Week competitions** - www.science.ie/competitions/
- **The Young Environmentalist Award:** ecounesco.ie/programmes/young-environmentalist-award

WorldWise Global Schools (WWGS)

WorldWise Global Schools (WWGS) is the national programme of support for Development Education (DE) at post-primary level. It is a one-stop shop of funding, resources and guidance for post-primary schools to engage in DE. WWGS is an initiative of Irish Aid (the Irish Government's programme for overseas development). The current WWGS programme is implemented through a consortium comprised of Gorta-Self Help Africa, Concern Worldwide and the City of Dublin's Education and Training Board Curriculum Development Unit.

For more information about WorldWise Global Schools and the opportunities the programme offers students, teachers and schools to engage with Development Education - particularly how to apply for our school award, the Global Passport - visit our website **www.worldwiseschools.ie**

For further DE resources and ideas for use in Science classes, **visit developmenteducation.ie** - a searchable, subject-specific, age-appropriate, thematic database of DE classroom materials from early childhood upwards.

Contact the WWGS team

The WorldWise Global Schools team is available to provide advice, guidance, training and resources for Development Education in post-primary schools in Ireland.

WorldWise Global Schools, Kingsbridge House, 17-22 Parkgate Street, Dublin 8
www.worldwiseschools.ie | **Email.** info@worldwiseschools.ie | **Tel.** 01 685 2078

Irish Aid
WorldWise Global Schools

***WWGS** is being implemented through a consortium comprising Gorta-Self Help Africa, Concern Worldwide and the City of Dublin Education and Training Board Curriculum Development Unit.*

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