

Lesson Plan: GEOLOGY OF THE SEASHORE

Class: 3rd to 6th Class

Subject: Geography

Strand: Natural Environments

Strand Unit: Rocks and Soils



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Aim / Objective:

There are many different types of beaches around Ireland. By looking at the geology of the seashore, students can study its rocks, soil, and minerals and learn about its origins. The geology of the seashore also offers a natural environment for many species and plants to live.

Skills:

Students will have developed questioning and predicting skills as well as the following geographical investigation skills:

- Questioning
- Observing
- Predicting
- Investigating and experimenting
- Estimating and measuring
- Analysing
- Recording and communicating
- Evaluating

Materials:

- 5 x Buckets / containers or trays for placing samples in.
- Samples: mud from the seashore, sand, shingle, stones / rocks (including all shapes and sizes, textures, colours), shells fragments etc, Magnifying Glass

See Activities below for specific materials required.

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Preparation / Background:

Irelands Beaches and Bays

Shorelines form where the sea meets the land. They can range from sandy, shingle, to rocky shorelines, muddy inlets and extreme cliff faces.

What is sand?

Sandy shores are soft and are formed by the deposit of tiny particles made up of silt, clay, rock and shells. The particles make up grains of sand, which vary in size. Sand can be very fine to very coarse ranging from about 1/16 of a millimeter to 2 millimeters in diameter. Smaller particles of sand are described as silt. Larger particle sizes are described as gravel.

Where does sand come from?

Sand comes from land (earth) origins and from marine origins.

Land origins: The majority of sand particles come from the land. These particles are carried by the rivers to the sea. The erosion of land near the shorelines can also produce sand deposits. This is caused by the constant pounding waves and weather elements such as wind and rain and the heat from the sun.

Marine origins: Sand that comes from marine origins is called carbonate sand. Carbonate sand is the result of particles of broken down shells, skeletons of other marine animals and coral. The sand particles are transported by water (waves and tidal action) and the wind forming beaches, dunes, sand banks and sand bars.

Why are there different coloured sandy beaches?

There are many rocks and minerals around the world, all of which contribute to the many different types of seashores. The seashore's all have their own unique structure, texture and colour.

Silica sand is one of the most common types of sand found in continental and non- tropical areas of the world. Silica comes from quartz rock and is very hard. Quartz is clear (in its purest form) to white in colour. Where traces of metal and impurities are found, the more coloured it will become. Therefore, silica sandy beaches can range in colour from grey to iridescent.

Bright white sandy beaches in tropical and subtropical destinations are made up of limestone, coral and fragments of shells. Many black sandy beaches are either volcanic in origin or contain magnetite (it is magnetic!). Other sands have high levels of iron in them and are rich and yellow in colour.

What can sand be used for?

Sand is used for many things including:

- Sand casting - used as a form of moulding material.
- Concrete and bricks - contains a high volume of sand.
- Glass - sand is a central component.
- Textured paint
- Sandbags – used to prevent flooding

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Other Seashore Features

Rocky Shores

Sometimes the seashore is composed entirely of 'bedrock' with no loose material sitting on the surface. However, there will be often loose rocks and boulders of varying size lying on the bedrock.

Different types of rocks can be found on the seashore and can be indicative of the past and present geology of the local area. There are three different rock types. These include:

- **Igneous rocks** – are rocks that have been formed under extreme heat. Igneous rocks form directly from volcanic activity (magma). Those that have been formed under the Earth's surface are called igneous intrusive rocks such as granite. Igneous rocks formed above the earth's surface (i.e. due to volcanic eruptions) are called igneous extrusive rocks, such as pumice and basalt.
- **Sedimentary rocks** – are rocks that have formed from other rocks that have eroded. The rock material is deposited as sediment by water, wind or ice. Over time (i.e. thousand to millions of years) and pressure, the material recombines and cemented to form solid masses of rock. These rocks contain many minerals such as quartz.
- **Metamorphic rocks** – are rocks that have resulted from the metamorphism of other rocks. The rocks reformed can vary in appearance due to the exposure of temperature and pressure.

Some rocks on the seashore are so old that fossils can be found in them. Fossils are animals or plant life that were been buried in the sand or mud. Over millions of years, they have mineralised leaving an imprint in the rock. Geologists as far back as the 1700's used fossils to compare rock formations from different locations to create geologic maps.

Fossils are very important to scientific study as we can learn about the natural environment, animals and plant life from millions of years ago. Those that have studied fossils and the natural environment have found a great number of shells and other marine life from the sea" contained in the layers of rocks (stratum).

The oldest known rocks in Ireland are 1.7 billion years old and are found in County Donegal.

Cliffs

Cliffs are steep rock faces and can often be seen in coastal areas. Cliffs are formed by weathering and erosion. Weathering is the wearing down of materials (i.e. rocks) caused by air, water, plants and animals. This happens at the upper parts of the cliff. Erosion is the movement (i.e. through wind and water) of the materials. This happens at the base of the cliff.

Hard rock's erode and weather more slowly. Softer rocks, such as clay, shale and some sandstones or fractured rocks can erode more easily. Cliffs in these areas can be very unsafe.

Ireland has some of the highest cliffs in Europe. Croaghau, on Achill Island, is the second highest cliff in Europe and the highest in Ireland at 668m. The other highest cliffs in Ireland include the Slieve League cliffs in County Donegal at 601m and the Cliffs of Moher, which are 217m.

All these cliffs are located over the Atlantic Ocean.

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Activity:

Examining the Sand and Rocks from the Seashore / Rock Classification

Materials:

- Sugar Cubes
- Jar with lid (1 per group)
- Samples: mud from the seashore, sand, shingle, stones / rocks (including all shapes and sizes, textures, colours), shells fragments etc, Magnifying Glass

1. Discuss with the students what they walk on when they are at the beach. (*Encourage students to think about the different types of seashores - mud, sand to rocky shores*).
2. Create a seashore centre in the classroom showing samples of mud from the seashore, sand, shingle, stones / rocks and shells fragments.
 - Examining the sand and rocks from the seashore will help students think about where sand comes from.
 - Get the students to touch, describe and document what the different textures feel like. Using the magnifying glass get the students to describe and document what they see. Explore the similarities and differences of the sand, rocks and shells fragments.
 - Discuss with the students what they think sand is made of and where it comes from.
 - Guide the students to learn that grains of sand (depending on which beach it has come from) are tiny pieces of rocks and/or shells that have been broken into very tiny pieces. Discuss how these particles have been tumbled and banged against each other over time by tides, currents and waves.
 - The distance the rock and shells have travelled before it ends up on the seashore can influence the how soft or hard the sand is. Sand and rocks found on the beach may be either angular or very rounded and smooth. The more distance the sand and rocks travel the more likely it is to be knocked around, breaking off sharp edges, leaving a smoother, more rounded surface to the grain.
3. To demonstrate how rocks can be broken into tiny grains of sand, divide the class into groups. Give each group a jar with a few sugar cubes in it. Explain to the groups that the sugar cubes represent stones and rocks travelling out to sea from the rivers.
 - Each person in their group should take turns shaking the sugar cubes in the jar. Explain that this represents the rocks and seashells be tumbled about by the waves.
 - Observe and record the results of what happens to the cubes of sugar when they tumble and bang against each other.
4. Discuss rock classification and where the rocks came from, how they are formed and where they have been. Depending on the location and the surrounding geology, many different rock types can be found on rocky seashore.
5. After collecting different types of rocks, get the students to classify and describe the rocks. A mineral guidebook can help to determine the actual name of the rock. Each student should create a rock notebook. Draw a picture of each rock and record information about it including: Where the rock was found (i.e. teacher to provide name of seashore / area), Colour/s, Size, Shape, Texture such as Smoothness / Roughness, Other features such as grain-size, weathering, softness, hardness etc.

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Activity:

Make your own Fossil

Materials:

- Bowl
 - 2 cups of flour
 - 1/2 cup of salt
 - 3/4 cup of water
 - waxed paper
 - old t-shirt (to keep clean)
1. Discuss what fossils are and how they can be found in rocks on the seashore.
 2. Make a look-a-like fossil to capture in time shapes and textures of plant and shells from the seashore.
 - Get students to put on their old t-shirt so they do not get their clothes dirty.
 - Mix all the ingredients in a bowl.
 - Knead the dough for 5 minutes and then flatten out the mixture on some waxed paper.
 - Get students to put their initials on the dough underneath the flattened mixture.
 - Get old shells or leaves and press them firmly onto the top of the dough. Leave to dry on a windowsill for a day or two and then turn to dry the other side.
 - Investigate to see what has happened.