Spirits of the deep

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It is a rare child whose imagination is not sparked by the beach and the sea is rare and therefore this interdisciplinary lesson has a lot to offer the teacher who wants to make learning as interesting and relatable as possible.

India has a coastline that extends up to 7517 kilometres. It defines the regions touched by the sea with a diversity of languages, food and culture. Our coast is also rich in biodiversity – with two seas meeting at the tip of the southern peninsula! The elusive dugong, the largest fish – the whale shark, the Olive ridleys that visit our coasts in thousands in an awe-inspiring natural phenomena called the *Arribada*, the mangroves that line our coasts and provide a cradle rich in nutrients for the species that fill up our seas – the coast is a place that provides a seemingly endless array of riches – that benefit both the natural ecosystem and human civilization.

On the one hand, beaches provide obvious lessons... what do we find there? The sand, the creatures that live in it, the foliage and the ecosystem therein. On the other hand, we have the magic that Nature provides, that has inspired art and poetry, kindled the imagination of several people to produce works that have outlived their creators.

A good way to start this lesson would be to ask the students if they have spent time by the beach. If they live in a city on the coastline, the answer is bound to be a resounding yes. Ask them for quick impressions and board their responses in various categories. If your school is located far from the sea, chances are that many students have not visited the beach. Get the ones who have visited to speak to the

class about their experiences...let them talk about the texture of the sand, walking barefoot, all the sights and smells. A few videos or photographs that just show coastlines and beaches in all their splendour can be very useful to show in schools that are not on or near the coastline.

Language

The beach and the sea have been written about by poets ranging from Wordsworth to Tagore. A good selection of poems may be found here – https://bookriot.com/2018/01/21/ocean-poems/

Put up these poems around the classroom and let the students read them. Ask them to read out loud the ones they like best. For a poem, *On the Beach* by Michael Williams and *Me, My Dog* and the *Beach* by Karen Curcio are good choices for older and younger students respectively. A more specific poetry exercise could be to introduce Haiku for grades 4 and above.

Elicit a list of words that come to mind when one thinks of the beach or coast. If you're situated in a city that doesn't have a coast, playing a few videos or showing pictures may help the learners come up with words.

Activity 1: What are the words that go together
Once there are a considerable number of words in the 'beach list', divide the class into groups.

Each group is given an equal number of words and tasks to go with it. For every word, each group has to come up with rhyming words (maybe 6), adjectives and verbs that best go with the word.

Activity 2: Building a crossword
Let each group choose 6-10 words from the list. They then come up with definitions and clues that give the meaning of the word. A grid is created and a crossword is built with the clues below. This can also be done using a crossword builder on the computer. For ex: https://crosswordhobbyist.com/?msclkid=26e4ee29d779199c9fd48e9738659a27

Activity 3: Writing a haiku
Haiku is a very short form of Japanese poetry that is written in three phrases of five, seven and five syllables respectively. This is an excellent activity for students as there isn't much writing involved but a lot of thought and sounding out of words.

They can use the words from Activity 1 to get them started. Start a discussion and elicit responses on how the sand feels, the sounds of the sea, the creatures in the sand, the feel and taste of seawater. Get the ball rolling by reading them some haiku.

History and geography

India's coastline borders the states of Gujarat, Maharashtra, Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Orissa and West-Bengal! The island territories of Andaman & Nicobar and Lakshwadeep are also part of our coastal zones. A number of cultures make up this coast…ask the students to make a list of cultures and languages along the coast. Do they know a culinary dish or song from each of these regions? Maybe some of the students are from these places and can add to the lesson with their inputs.

The world's first dock at Lothal. Photo courtesy: www.harappa.com

Who are the people who came to India through the seas? When did they first come here? There is evidence to show that the Harappans were carrying cargo in bulk to Mesopotamia, Oman and Bahrain. Sea routes were thus established as early as 2900 BCE. In fact, the world's first dock was at Lothal, in present day Gujarat. India was visited by and traded with Rome, Malaya, Baghdad, Sumatra and Java, much before the Portugese, Dutch and the East India Company came to our shores. (https://en.wikipedia.org/wiki/Indian_maritime_history)

Activity 1: Mind-map and timeline

Create a mind-map along a timeline of the different cultures that India connected with through its coasts. The students can plot the different time periods along a timeline. Below each time period, they can write down who engaged in trade, or visited India through sea routes. They can also add interesting facts, illustrations, flags of countries as they are known in contemporary times, and create an engaging and interesting visual that shows all the information they'd like to present from the earliest time onwards.

Activity 2: Create a world map showing the sea-routes employed in those times between India and other civilizations/nations.

Activity 3: Print pictures of the items of trade, the various people of those times and create a poster or collage that shows the various influences. Print pictures of the evidence (Roman coins, seals, etc.) and include them in the collage. Are there any forts, places of worship or other buildings that hark back to those ages? Include their pictures in the collage as well.

These activities are better conducted in groups, as there is enough scope for discussion and shared research.

Geography

A number of land and water forms make up this long and varied coastline. Is the coast similar throughout its length? What are the variations found?

Some excellent references can be found here https://www.worldatlas.com/articles/how-is-a-beach-formed.html

Activity 1: Getting familiar with land and water forms

A good way to start this lesson would be to hand out outline maps of India and ask the students to identify the coasts and beaches that they are already aware of. Ask them which beaches they have visited, which state it is a part of and mark it on the map.

Next, mark all the land and water forms associated with coasts. Gulf, Bay, Coastline, Lagoon, Delta, Peninsula, Strait, etc.

Lesson plan: Once this activity is done and the students are thinking of beaches, get into the lesson. How are beaches formed? Where do the sand, rocks that make up beaches come from? Are all beaches the same? What are the different types of beaches? How is the Arctic Beach different from the Marina Beach?

These questions can be answered by the students themselves as a Web Quest.

Activity 2: Web Quest
Divide the class into groups of equal numbers. Give each group a different question to work on. They can either use a computer or books from the library. For each question, the students should gather as much relevant information as possible along with interesting facts. These can be supplemented by pictures and diagrams.

The object of this task is for each group to make a presentation to the class.

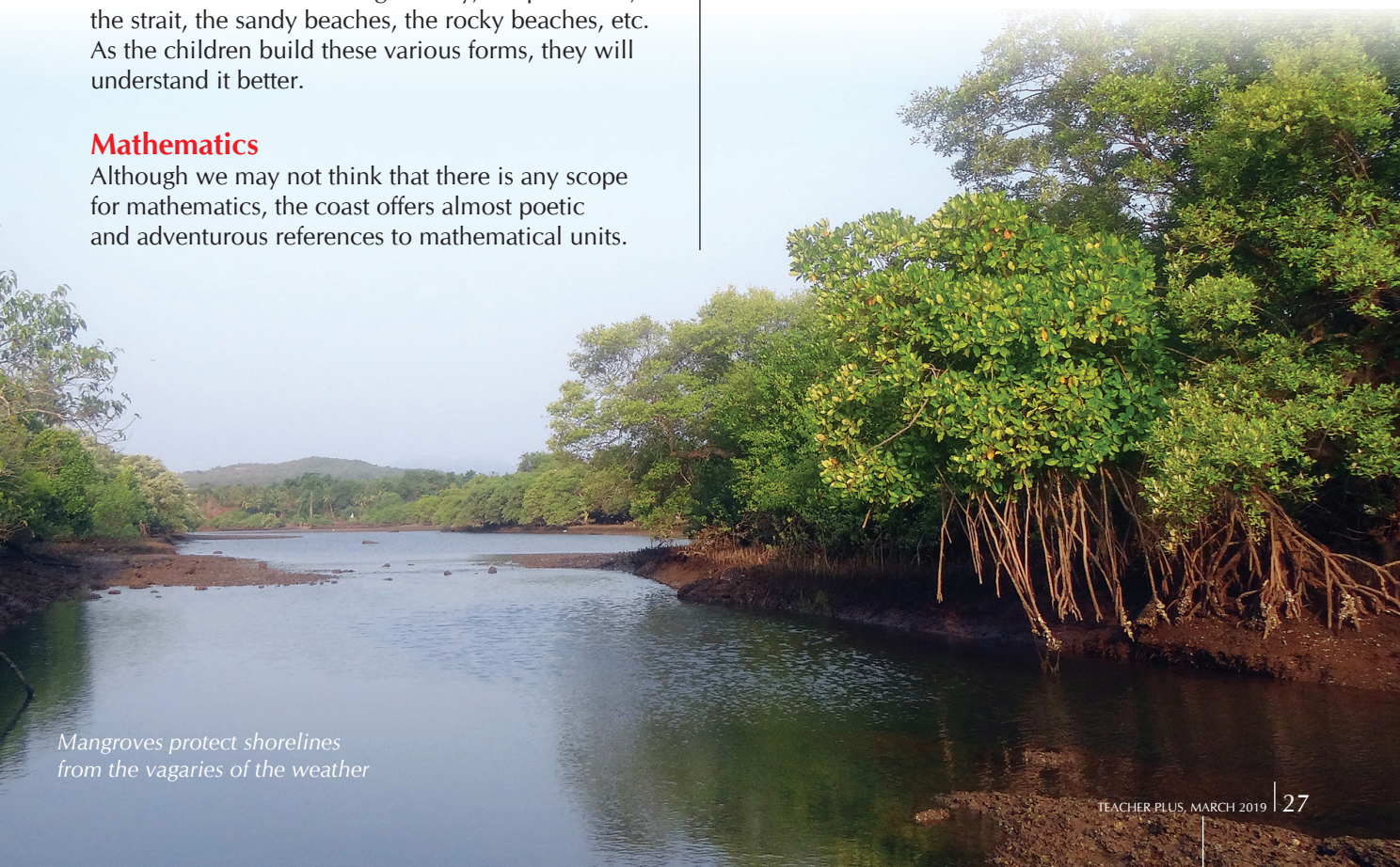
Activity 3: Clay modelling
This lesson can be wrapped up with a clay model of India's coastline showing the bay, the peninsula, the strait, the sandy beaches, the rocky beaches, etc. As the children build these various forms, they will understand it better.

Mathematics

Although we may not think that there is any scope for mathematics, the coast offers almost poetic and adventurous references to mathematical units. Nautical miles, knots are the units of distance and speed used at sea. A fathom is the unit of depth in the sea and altitude is always measured in terms of Mean Sea Level. These terms may be of interest and the units can be converted into kilometres to promote a better understanding of the distances involved. There are many resources online to help teachers prepare lessons in this context. These can be altered to an Indian context to make the lesson more relatable to Indian students.
https://mashupmath.com/blog/2017/3/2/how-to-teach-kids-to-understand-elevation-above-and-below-sea-level
https://www.illustrativemathematics.org/content-standards/tasks/288

Biology and environmental science

The coastal ecosystem
If the sea is the cradle of all life, the coast is its nursery. The interface between the sea and land; the delta, the lagoon, the backwaters and mangroves are crucial nursery areas for shrimps, crustaceans, mollusks, and fishes. These areas are rich in nutrients while also offering protection from predators. The importance of mangroves cannot be over-emphasized. They protect shorelines from the vagaries of weather – be they storms, hurricane winds, waves or floods. The tangled roots of mangroves stabilize sediments and guard against



Mangroves protect shorelines from the vagaries of the weather

erosion. They trap sediments originating from land and maintain water quality and clarity.

Teachers can make a presentation about the tsunami of 2004. What are the natural barriers we need to protect the coast from cyclones and tsunamis? Why was there so much damage? The coasts have been almost completely stripped of mangroves, indigenous trees and sand dunes. These provide a buffer between the sea and human settlements, protecting us from strong winds and breaking the force of waves.

Exercise 1: Field trip to a beach
Children may be taken to a beach either early mornings or early evenings to study the plants and animals they see there. The teacher can perhaps prepare a worksheet that will point them towards things they should be looking for. (Going on a fieldtrip with a pre-planned agenda and tasks ensures better focus and enables more learning.)

They can also look at the features of the sand. The types of shells they find. The class can be divided into groups and each group can make etchings of shell patterns, draw the different types of shells they see. They can also either take photographs of the crabs or draw them.

Do they find track marks of animals and birds on the sand? Let them photograph or draw them.

What kind of birds do they see here?

What about stray dogs? Are there many? How do they affect the ecology of the beach?

What kind of plants do they see? Are the plants deeply rooted or are the roots shallow. Are the plants tall or short and is their spread horizontal or vertical? What is the purpose of their roots in relation to the sand?

Let the children also look at the water's edge. They may observe jellyfish, sea weeds, driftwood with barnacles, etc., that are washed onto the shore by the waves.

An observation exercise where they sit quietly and observe the movement patterns of crabs and make notes on it can lead to an interesting discussion in the class.

Let them think about what kind of adaptations creatures that live in coastal beaches and in sand have developed? How different or similar are they from creatures that live in desert sand?

If a beach field trip is not possible, the same exercise may be done through a web quest or library research after a preliminary presentation of pictures made by the teacher.

Exercise 2: This exercise can also tie in with environmental science. The children can also observe the debris left behind by human visitors. Does this stay on the sand or go into the sea? How do plastic and non-biodegradable waste affect sea-life? Is there rubble and construction debris along the sand? Are there plantations of casuarina along the sea or are there sand dunes and coastal foliage?

Exercise 3: Web-quest on the horse-shoe crab
The horse-shoe crab is one of the most fascinating creatures on our coast. Originating 450 million years ago, the horse-shoe crab is a living fossil, unique in many ways. They use haemocyanin to carry oxygen in their blood, because of which their blood is blue! They live in shallow coastal waters and come ashore to mate. For more information: https://en.wikipedia.org/wiki/Horseshoe_crab

The horse-shoe crab lives in shallow waters and comes ashore to mate.

Divide the class into groups and ask each group to come up with a comprehensive web-quest on the horse-shoe crab. The information they find can be presented in a poster or a booklet, or in any other way they can think of. Prepare a list of headings that they must include in their presentation. This exercise is suitable for students of age 10 and above.

Seasonal visitors: The Olive ridley turtle nests in Orissa in a magnificent annual ritual of mass nesting or arribada. The beach is literally covered with nesting turtles who dig nests, lay their eggs and go back to sea. Sea turtles always go back to the beach where they were hatched to lay their eggs. *The Killing Fields* by Shekar Dattatri (https://vimeo.com/20724817?fbclid=IwAR02evuk72L62Ox0KDILwy_tw7uwhBMrXS7C_uL0wuBb9ct6vjGZjjlSbbA) is a wonderful documentary to understand this natural wonder and the dangers that are faced

The arribadas of Olive Ridleys are considered one of the wonders of the world. Photo courtesy: Dusty Foot productions

by the sea turtles due to human intervention and mismanagement of coastal areas.

Other film resources:

Love Nature (https://www.youtube.com/watch?v=SIMXZUDJqzU) has an excerpt on sand dunes and their importance along beaches.

Art

Everything the children have learnt can be installed in a wonderful art exhibition. The poems they have written about the sea can be framed and displayed. An arribada can be created with 3d paper turtles (https://www.woojr.com/3-d-paper-turtle-craft/) nesting on a sand pit. "Nests" in deeper sections of the sand can be created with paper eggs in them. Origami crabs can also be made and placed in the sand https://www.youtube.com/watch?v=NJDFkIDoJJw. Sea shells can also be placed to lend more authenticity to the scene.

Message in a bottle: Old glass bottles can be cleaned and dried. Then, they can be filled beautifully with sand and shells. Each child can write a short pledge or message about conserving coastal ecology, roll it up, tie it to a string and place it in the bottle with the string hanging outside. Visitors can easily pull out the message, read it and place it back in. There are many images online to spark some creativity for this activity.

The etchings that the children made on shells can also be displayed.

A beach scene can be created with the shells and crabs they saw...children can recreate what they saw with paints or crayons. A guide to drawing crabs may be found here https://www.artforkidshub.com/how-to-a-draw-crab/

Folk songs: The children can learn a folk song from at least three fishing communities or coastal communities of India and make a presentation.

This study of our coasts can keep students engaged for at the very least, a month or more. Interdisciplinary studying leads to a deeper engagement with the subject. Studying the beach is an activity almost without limits; one question leads to another and the answers lead to more questions. The discovery of the coastline, through a variety of subjects, leads to a deeper understanding of why coasts are important – as an interface between land and sea, as a region that introduced travellers of yore to new cultures, as a crucial component of our ecosystem that must be cared for and protected.

The author is a documentary filmmaker and teacher, who is currently exploring ways to talk to children about their world through art.

ORANGE

Porto Ferro Beach, Italy

Orange limestone & volcanic deposits

RED

Kaihalulu Beach, Hawaii

Iron rich crumbling cindercone

Beaches around the world come in many different colours, depending on the sediments and minerals that make up the sand. Here are a few examples of these beautiful products of geology and time. You can look up the internet for more information about colourful beaches.

GREEN

Papakolea Beach, Hawaii

Mineral olivine eroded from lava flows

Poster illustration: Aditi Elassery