

TEACHING GUIDE



For Ages
9 to 13 years

Dear Educator,

Congratulations, you have joined the education revolution by teaching with the most unique educational product in the world, ENGAGE magazine. You know that your students need more than a textbook to succeed. ENGAGE gives them an authentic learning experience that exposes them to real scientists doing real science. You exemplify teaching excellence and expect nothing less from your students and the materials you use in the classroom.

In this issue, you and your students travel the world to learn how people are helping save orphaned animal babies. Students learn that people interact with and are part of the natural world. After raising animal babies, students discover how wild winds generate fierce storms, including sandstorms, cyclones, monsoons and tornadoes. Then they join geoscientist Andrés Ruzo as he discovers the Boiling River of Peru.

This Teaching Guide provides a framework you can use to teach these articles and link them to your curriculum. They can be used for whole-class, small-group and individual instruction.

Each lesson develops students' ELA skills and teaches science concepts. Use all the lessons, activities and worksheets, or pick and choose the ones appropriate to your teaching style.

ENGLISH • STEM • ENVIRONMENT • SOCIAL STUDIES • CITIZENSHIP
engage
LEARNING

Vol 1, Issue 2, Levels 3/4

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MEET THESE STANDARDS

- ✓ **Language Arts:** Students will read a range of print and non-print texts to build a better understanding of texts.

Students will draw on a variety of comprehension strategies as needed; that is, generating and responding to essential questions.

- ✓ **Life Science:** Students will understand that people cause changes in natural, built and social environments, and they act together in solving problems to ensure ecological sustainability.

- ✓ **Earth Science:** Students will understand the causes of severe weather.

Students will understand how a boiling-hot river forms.

- ✓ **Citizenship:** Students will understand that human actions affect the natural environment.

Note: We incorrectly captioned and credited the magazine's cover photos. They should read:

LEVEL 3: Elephant orphan with caretaker

Photo: The David Sheldrick Wildlife Trust

LEVEL 4: Lightning Storm Photo: Jason Weingart

RAISING BABIES

LIFE SCIENCE STANDARDS

Students will understand that people cause changes in natural, built and social environments, and they act together in solving problems to ensure ecological sustainability. They will investigate the features and needs of living things, and demonstrate an understanding of their interdependence with each other and the physical world.

LANGUAGE STANDARDS

Students read a range of print and non-print texts to build a better understanding of texts. They conduct research on issues and gather, evaluate and synthesise data from a variety of sources to communicate their discoveries in ways that suit their purpose and audience.



BEFORE READING BUILD BACKGROUND

Discuss the following with the students:

- Do they have pets at home?
- How are pets and wild animals different?

READY TO READ

- Hand out copies of ENGAGE magazine and have students turn to page 3. Read the sentences using voice modulation and pronunciation.
- Discuss the following with the students:
 1. Why is caring for animals an essential task for humans?
 2. How can caring for animals help us empathise with their needs, thus making us grow up into people who care for our environment?
 3. How have human actions reduced animal populations and encroached on habitats, thus creating many animal orphans?
 4. What are the special needs of each of the animal orphans that we read about?

AFTER READING: EXTENSION ACTIVITIES

SCIENCE & LANGUAGE ARTS CONNECTION

SESSION FOCUS: ABOUT ORANGUTANS

- Show students the video **Orangutan Diary Series 1** <https://www.youtube.com/watch?v=U6lppEceXhA> This is a 30-minute segment, in which Steve Leonard, a qualified vet working with the BBC Natural History Unit, and Michaela Strachan, a TV presenter, visit the Nyaru Menteng Centre in Borneo.
- Ask students to make notes as they watch the video. They can also refer to ENGAGE magazine to answer the questions.
- After the viewing, they will answer the BLM – **Comprehension Check: Orangutans.**

SESSION FOCUS: ABOUT ELEPHANTS

Ask students to share what they know about elephants with the class. Record their information on the board in the K column of a KWL chart.

Know	Want to know	Learned

- Next, ask students what they would like to know about elephants and write it in the W column.
- Show the following videos to students.
Interesting Facts about Elephants <https://www.youtube.com/watch?v=BIXrL7qfcv4>
Elephant Orphans – Wisdom of the Wild <https://www.youtube.com/watch?v=UeTmE71uEaw>
- Re-read pages 6–7 in ENGAGE magazine. Ask the following questions:
 1. How do elephants use their trunks?
 2. How do elephants communicate with each other?
 3. In what ways are elephants like people?
 4. How do people both help and harm elephants?
 5. How do elephants’ tusks help them survive but also put them in danger?
 6. What are the dangers to an elephant’s life?
- Ask students which questions on the KWL chart have been answered.
- STATE: The main reason for elephants being hunted is their ivory. Ivory poachers cut tusks off their kill, leaving the rest of the animal behind. Asian elephants are also captured to be used for work, since they have a high level of intelligence. It is easy to train an elephant without using harmful techniques such as beatings. Discuss whether it is incorrect to hunt elephants to earn money. Why or why not? Ask students if they think hunters and poachers should be arrested.
- SHARE THE FOLLOWING with the students:
 1. Due to deforestation, elephants and other animals are in competition with people for space, food and water. Elephants sometimes wander into villages and farms to find food. To protect their farms, farmers drive elephants away and, in the process, injure the elephants. During these clashes, elephants sometimes kill people. In some regions where disappearing habitat puts elephants in direct contact with humans, people may resort to selective killing. This further reduces the elephant population.
 2. There is a wildlife rescue and rehabilitation centre near the Kaziranga National Park in Assam. It helps elephant calves that have

been separated from their herds. The calves may be orphaned as a result of poaching, stranded due to floods, or rescued from illegal wildlife traders. Without rehabilitation, these calves would most likely die or face lives in captivity. Caretakers care for the calves and then try to reunite each calf with its herd or release it into a protected wildlife reserve.

ACTIVITY: Interview with an Elephant Carer

- Students work in pairs to role play an interview to present to the class.
- Have students think about the role of the caretakers at the rescue centre and what questions they would like to ask the caretakers.
- Instruct the students to record their questions and answers and then present them.
- Give the students a model question, how it would be asked, and then the answer.

SESSION FOCUS: ABOUT SLOTHS

- Read along with the students the information given in the following AV links:
 - <https://www.worldwildlife.org/stories/why-are-sloths-slow-and-other-sloth-facts>
 - <http://kids.nationalgeographic.com/animals/sloth/#sloth-beach-upside-down.jpg>
- Then, have the students listen to the story of the sloth in this video: <https://www.youtube.com/watch?v=LRPTF3G5sF4>
(Note: Though the story is a picture-book reader for younger children, it is meaningful for all ages.)

‘Slowly, Slowly, Slowly’ is about a sloth who lives in the South American jungle among other animals. As each animal comes along and questions the sloth about his lack of spunk, he repeatedly ignores them, until a jaguar comes and asks why the sloth is so lazy. The sloth takes exception to this last question and gives the jaguar a clear response about the difference between being tranquil, laid-back and peace-loving, and being lazy. (If necessary, point out that animals cannot talk and many of the animals in the video have a predator-prey relationship.)

- After the story reading, ask the following questions:
 1. Where does the sloth live?
 2. Does the sloth live by itself or with others?
 3. What makes the sloth different from other animals?
 4. What does the sloth eat?
 5. What does the sloth have or do that helps it escape from predators?
 6. What does the sloth look like?
- Lead students in a discussion about whether they think the sloth is lazy because it moves slowly? Ask students to list the benefits of resting and going slow. Ask students what evolutionary advantages slow movement gives the sloth.
- Ask the students if they think the word ‘slothful’ exists or is it something the sloth made up. If they had to describe themselves what would be the one key word they would use? Have the students share this with the class.

Vocabulary Builder:

- The sloth replies using a lot of words to describe himself and his actions:

slow, quiet, boring, lackadaisical, unflappable, languid, stoic, impassive, sluggish, lethargic, placid, calm, mellow, laid-back, relaxed, tranquil.
- Ask students to find the meanings of the words and write sentences using these words. Then ask students what the words have in common. (*They are adjectives.*) Then ask students what all these adjectives have in common. (*They all have similar definitions.*)

Sloth Word Web

Guide students to draw an outline of a sloth and create a word web that describes the sloth. For example: mammal, slow, covered with algae, lives in trees, hangs upside-down, etc.

LANGUAGE ARTS CONNECTION

SESSION FOCUS: DEBATE

Hold a debate on the following topic:

Level 3

Should wild animals like orangutans/sloths/elephants be kept as pets?

Level 4

Is it okay to destroy natural habitats for human development?

GEOGRAPHY CONNECTION

SESSION FOCUS: MAPPING

On a world map, mark the places where orangutans, elephants and sloths are found. (Use an atlas to help you.) Mark your country on the map, too, to understand where these places are in relation to India.

- Orangutans live in the wild on the islands of Sumatra and Borneo.
- Elephants live in Asia and Africa.
- Sloths live in Central and South America.

ENVIRONMENTAL MANAGEMENT & CITIZENSHIP CONNECTION

SESSION FOCUS: SAVING HABITATS

- Ask students whether they have pets at home and how they look after them. Discuss how just having a pet doesn't mean that you are taking care of it. The pet needs to be fed, cleaned and looked after like a member of the family.
- Discuss how people have encroached on and destroyed animal habitats. In cities such as Mumbai, we have news that leopards were seen in the residential area of Powai. This is mainly because of human interference in the forest areas where these animals live. Animals do not have physical boundaries in their areas of habitat, and so they wander into human areas. In Indonesia, a lot of forest area has been cut down to grow a specific kind of palm tree to fuel the palm-oil industry. This creates forests that have only one kind of tree. Many different kinds of trees grow in most forests, providing different kinds of habitats for plants and animals.
- The following article helps to understand the scale of habitat loss in India: <https://scroll.in/article/809286/in-just-30-years-india-has-lost-large-forests-to-23716-industrial-projects>.
- Discuss how the three R's – reduce, reuse, recycle – can help in maintaining the environment. When we safeguard the environment, we reduce the number of animal

orphans. You can read more about the three R's here:

- <http://www.recycling-guide.org.uk/rrr.html>
- <https://www.epa.gov/recycle>
- <https://www.veolia.co.uk/nottinghamshire/recycling/recycling/3rs-reduce-reuse-and-recycle>

- Each time we throw any non-biodegradable product into the garbage, we add to the huge amount of pollution that is generated every day. This is especially true for plastics. Talk to the class about how people are aiming at a no-waste life and are recycling and reusing everything. When we take such steps consciously, we slowly move towards helping animals reclaim their space. The more we recycle and reuse stuff, the less we cut down forests for our own use.
- Ask students to suggest ideas on how forests can be renewed. If possible, use Google Maps to show how much area is covered by forests in the world today. For more information, see here: <http://www.globalforestwatch.org/>
- Read more about loss of forests and what countries around the world have done to renew forests and stop deforestation.
 - <http://articles.extension.org/pages/71908/forest-renewal:-natural-regeneration-or-tree-planting>
 - <https://www.ontario.ca/page/forest-renewal>
 - <http://forestinfo.ca/forest-renewal/>

SESSION FOCUS: DESIGN A POSTER

Level 3

- Give students the following thought starter and ask them to design a poster:
You would have noticed that some people keep exotic pets. Some keep dogs in a tropical country like India that usually need cold climates. Have students design posters which show a position on the starter. Ask each student to explain the position presented on their posters.
- Display the students' creations on the bulletin board.

Level 4

- Give students the following thought starters and ask them to design a poster:
Are all stray baby animals orphans? How do you think orphaned animals should be cared for? Design a poster that shows how a professional caretaker would care for a specific kind of orphaned animal.
- Refer to some of these links for points that can be discussed with the students.
 - <http://www.nbcwashington.com/news/local/What-to-do-if-I-find-a-stray-dog-cat-Animal-Care-Guide--320790311.html>
 - <http://www.wikihow.com/Care-for-a-Neglected-Dog>
 - <https://help.four-paws.org/en/care-stray-animals>
 - http://www.humanesociety.org/animals/resources/tips/what_to_do_stray_pet.html

SCIENCE CONNECTION

SESSION FOCUS: RESEARCH

Level 3

- Students can research organisations that work to protect orangutans/elephants/sloths and make a list of things people can do to help. They need to include the following pointers:
- The name of the animal and its characteristics.
 - Why is its natural habitat being destroyed?
 - Organisations working to save these animals.
 - An action list for people to help.
 - How can students contribute towards protecting the animal?

Level 4

- Students can research some organisations that work to protect endangered species and then make a list of things people can do to help. They need to include the following pointers:
- The names of the endangered animals and their characteristics.
 - How did they become endangered?
 - Organisations working to save these animals.
 - An action list for people to help.
 - How can students help protect these animals?

VIDEO HUB

Why Are Sloths So Slow? <https://www.youtube.com/watch?v=h0o51Anhz78>

Level 3

Why Sloths are Weird – Secrets of our Living <https://www.youtube.com/watch?v=vnAq27SvCiw>

Baby Orangutan Rickina https://www.youtube.com/watch?v=XrH_zkWG1HM

Noddy's First Day at School – Orangutan Diary https://www.youtube.com/watch?v=9q_9HH4yhQo

Baby Elephant Causes Havoc at Home <https://www.youtube.com/watch?v=dZ4E2gHoz6g>

Baby Elephants in Animal Orphanage <https://www.youtube.com/watch?v=SQP8K8yI47g>

Animals in their Natural Habitat <https://www.youtube.com/watch?v=Qto25S33mSU>

Level 4

Attenborough – Saying Boo to a Sloth <https://www.youtube.com/watch?v=ndMKTnSRsKM>

Attenborough – Amazing DIY Orangutans <https://www.youtube.com/watch?v=IFACrlx5SZ0>

Emotional expressions of an Orangutan <https://www.youtube.com/watch?v=OGFG1da8qo4>

Orphan Elephant Baby's Struggle for Survival <https://www.youtube.com/watch?v=ijN6yB8xG54>

LEVEL 3

ORANGUTANS: Comprehension Check

1. What does the Indonesian word *orangutan* mean in English? _____

2. What food do orangutans eat? _____

3. What is the name of the orangutan care centre in Borneo? _____

4. Kesi is the biggest orangutan in her group at the care centre. What is her disability? _____

5. What skills do the human caretakers teach orangutan babies? _____

6. Why does it take a few years to release orphan orangutans into the wild? _____

7. What is used as a bed for the baby orangutans? Why? _____

8. At the end of this episode, a wild orangutan is shot with an anaesthetic dart. Why? _____

9. Why are the forests of Borneo being destroyed? _____

LEVEL 4

ORANGUTANS: Comprehension Check

1. What does the Indonesian word *orangutan* mean in English? _____

2. What food do orangutans eat? _____

3. Kesi is the biggest orangutan in her group at the care centre. What is her disability? _____

4. Orangutans can easily catch diseases from humans. In this episode, lots of orangutans in the nursery group became ill. Describe the symptoms of the illness. Why were the caretakers so concerned?

5. What skills do the human caretakers teach orangutan babies? _____

6. Why does it take a few years to release orphan orangutans into the wild? _____

7. At the end of this episode, a wild orangutan is shot with an anaesthetic dart. Why?

8. Describe the rescue of the wild orangutan.

9. Why are the forests of Borneo being destroyed? _____

10. Name some other endangered animals? What can we do to protect them? _____

Read the article **Orangutans Face Possible Extinction** <http://www.orangutan.com/threats-to-orangutans/> Answer the questions:

11. What are the key threats to the survival of orangutans today? _____

12. Explain the connection between palm oil and the disappearance of orangutans. How would you reduce the use of palm oil? (*Clue*: You can read the fact sheet given on palm oil for the answer.)

WILD WEATHER

SCIENCE STANDARDS

Students obtain and combine information to identify various severe weather phenomena and describe their causes and impacts as well as explain how to prepare for each kind of storm.

LANGUAGE STANDARDS

Students read a wide range of print and non-print texts to build an understanding of texts and usage of words that help create descriptions. Students conduct research on issues, gathering, evaluating and synthesising data from a variety of sources to communicate their discoveries in ways that suit their purpose and audience.



BEFORE READING BUILD BACKGROUND

- Commence the session with a contemporary poem about storms. The poem is available at <https://hellopoetry.com/poem/76621/above-the-storms/>
- The poem discusses the disturbance caused by a storm and how peace and calm always follow a storm. This natural phenomenon replicates itself in our life too. We may be inundated by a number of problems and feel we are in the midst of a storm. But always rest assured that the storm will clear and things will calm down.
- Discuss the vocabulary used in the poem to show the turbulence caused by the storm – pounding storms, rampant destruction, endless days and nights, crash of lightning, whirling wind, shaking earth, breaking shelter, resounding thunder. All these words help describe a powerful and destructive storm.
- Discuss the poem by asking the following questions:
 - What is the poem about?
 - What feelings are invoked when you read the poem?
 - What words describe the storm in the poem?

— How do these words help to form an image in your mind?

READY TO READ

- Hand out copies of ENGAGE magazine and have students turn to page 10.
- Direct children's attention to the phrases:
 - sweeping sandstorms
 - shifting sands
 - monster monsoons
 - terrible tropical cyclones
- Discuss how the adjectives describing the storms add meaning and substance to them. These adjectives aid in the description and help the reader create vivid images in the mind. Remind the class about the words used in the poem they read (pounding storms, rampant destruction, endless days and nights, crash of lightning, whirling wind, shaking earth, breaking shelter, resounding thunder). These words help describe a powerful and destructive storm. While writing we could use such descriptive techniques to make our own writing powerful. It would create a greater impact on the reader.

- Tell the class that this method of writing is called the 'Show, not Tell' method of descriptive writing. In this method, the writer creates images using words to engage the reader with vivid descriptions. Such methods help students to enrich their vocabulary.
- Ask students to silently read through the story.
- Then ask them to think of a heading for 'Tornadoes' which would create a vivid image in the mind of the reader.
- Ask students to identify and underline any other words in the story that create a vivid visual image for them.

AFTER READING: EXTENSION ACTIVITIES

SCIENCE CONNECTION

SESSION FOCUS: WILD WEATHER RESEARCH

- **START THE LESSON BY STATING:** There are various weather phenomena which cause damage to life and property. While computer-assisted weather tracking and assessment systems help to predict some or most of them, it is still difficult to escape all the negative effects of a bad weather situation.
- Divide students into groups of four. Give each group a weather phenomenon described in the ENGAGE magazine to research and present in class. Focus on the following pointers:
 1. What is the weather phenomenon?
 2. How is it caused?
 3. Where does it normally occur?
 4. What is its impact on life?
 5. What steps should be taken as protection against the weather phenomenon?
 6. Which storms were the largest or had the most impact?
- Have the students present their research. Students can use different modes of presentation. After the presentation, allow students to have a Question and Answer session to answer and explain queries.

Level 4

After the session, ask a few probing questions in class. For example:

1. Tornadoes are a comparatively rare phenomenon in Asian countries. In the tornado video, which Asian country suffered the deadliest tornado in 1989?
2. What is a storm surge?
3. According to your understanding, which weather phenomenon is more dangerous – a tornado or a cyclone? (Both are dangerous. But one major difference could be that a cyclone is experienced for prolonged time whereas a tornado exists for a shorter period of time.)

ENVIRONMENTAL MANAGEMENT CONNECTION

SESSION FOCUS: DISASTER MANAGEMENT

- While the story does not focus on disaster, knowing how to stay safe in severe weather is very important. Share with students that the monsoons can cause havoc in India every year. In Mumbai, 26 July 2004 was a very scary day. A monsoon deluge had submerged the city. While the rains were heavy and torrential, it was also discovered that Mumbai was unprepared to handle such a natural disaster. The drainage system was clogged, stopping the waters from reaching the sea. The natural outlets and ponds had been replaced by buildings, so the water could not find anything to flow into apart from the streets of Mumbai.
- Discuss what disaster management is and why it is important. Disaster management involves planning what to do before, during and after a disaster or an emergency occurs. Though it is not always possible to completely eliminate risk, the damage caused by any disaster can be minimised by careful planning and prompt action.
- Different disasters call for different precautions. Discuss one or two of them in class. You will get help on disaster management techniques here: <http://www.disastermgmt.org>

The images below of Mumbai during a severe flood may be shown to the class.



Image Source: <https://www.slideshare.net/zehbamp/bombay-flood-2005>

ACTIVITY

Divide students into pairs and ask them to work on an action plan based on their observations: Your city municipal department wants to be prepared in advance for the monsoons. Prepare a plan of action and share with them the steps which can be taken to ensure there is minimum damage during the rains.

LANGUAGE ARTS CONNECTION

SESSION FOCUS: WEATHER BASED PROVERBS AND QUOTES

Learning Outcome: Students will be able to use proverbs and quotes based on climate and weather while using language.

Discuss the following proverbs and their origin:

1. *The higher the clouds, the finer the weather.*
Thin clouds indicate pleasant weather. Low heavy clouds mean you can anticipate rain.
2. *Red sky at night, sailors delight. Red sky in morning, sailors take warning.*
This is a saying based on how winds in temperate regions blow. Weather in certain areas in North America moves from west to east. A red sunset meant a pleasant day ahead for the sailors. They knew there would be no storm. But if the sunrise was red, then a storm could be expected.
3. *If the goose honks high, fair weather. If the goose honks low, foul weather.*
If the goose flies high, it means the air pressure is normal and hence the weather is clear. If it flies low, it means that the pressure is low and a storm is building up.

4. *If spiders are many and spinning their webs, the spell will soon be very dry.*

Spider webs break when the level of humidity in the atmosphere is high. The webs absorb moisture and break with the weight. Spiders generally do not build webs at such times. When spiders begin to spin their webs, it is understood that there are dry spells ahead.

All the above proverbs talk about one major idea. Storms are a part of life and we should be prepared for them. Life gives us indications of problems that are about to come, just like nature gives us an idea about how the weather will turn out. These proverbs are a strong indication of how language derives ideas from nature.

Discuss the following quotes and the motivation that they share:

5. *Sunshine is delicious, rain is refreshing, wind braces us up, and snow is exhilarating; there is really no such thing as bad weather, only different kinds of good weather.*

https://www.brainyquote.com/quotes/quotes/j/johnruskin108460.html?src=t_weather

John Ruskin says that it is our perspective that makes a situation bad. If we complain about the heat of the sun, the wetness of the water or the cold of the snow, we lose out on the beauty of nature. Every situation will have a good side. If we decide to learn from it, we will grow.

6. *Some people feel the rain – others just get wet.* <http://www.quotegarden.com/weather.html>

According to Roger Miller, when we do something, we need to do it with passion. If we feel that the work we are doing is important and fulfilling, we will enjoy it more.

ACTIVITY

Level 3

Write sentences with proverbs and quotes.

Level 4

Write a story using any of the proverbs or quotes as a thought starter.

SCIENCE CONNECTION

SESSION FOCUS: TORNADO IN A BOTTLE

You need:

- a clear plastic bottle with cap
- water
- glitter
- dishwashing liquid

To do:

1. Fill the bottle with water up to the three-quarter level.
2. Sprinkle in a few pinches of glitter.
3. Add a few drops of dishwashing liquid.
4. Close the lid tightly.
5. Turn the bottle upside down and spin it for a few seconds.
6. Once you stop, you will see a mini tornado in action.

MATHEMATICS CONNECTION

SESSION FOCUS: NUMBERS IN WEATHER

Learning Outcome: Students develop approximation and conversion skills of mathematical units.

- **STATE:** The 'Wild Weather' story in the magazine has several instances where numbers are used. Numbers represent a lot of items.
- Ask students to read the story and mark all the number-related instances and explain what the numbers have been used to describe. For example: distance, size, years, dates, timelines.
- Solve the BLM: **Math Mania**

VISUAL ARTS CONNECTION

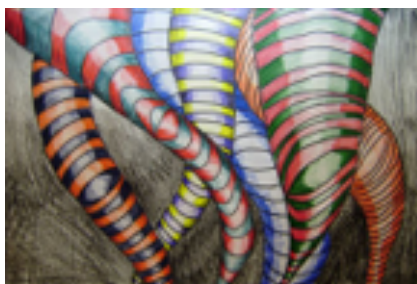
SESSION FOCUS: TORNADO ART

You Need:

- art sheets
- colour pencils

To do:

1. Display the image given.
2. Students need to draw tornadoes and choose the colours carefully so that each tornado stands out.



(Source of image <https://www.artsonia.com/museum/art.asp?id=19709909>)

GEOGRAPHY CONNECTION

SESSION FOCUS: PREDICTING MONSOONS IN INDIA

- Share the following information with the students: The word 'monsoon' is derived from the Arabic word *mausim* which means season.
- Show students the following videos to explain how monsoons can occur:
 - Monsoon Formation 2 <https://www.youtube.com/watch?v=We4ss7xUIKM>
 - Indian Monsoon <https://www.youtube.com/watch?v=cUOnPL1BCrU&t=11s>
 - Interesting Facts about the Monsoons in India <https://www.youtube.com/watch?v=0pLICKmRfvg>
 - Teacher's reference for further information: <http://www.srh.noaa.gov/jetstream/synoptic/wind.html>

- **EXPLAIN:** We need to predict the monsoon pattern since lots of people in the tropics and subtropics rely on the rains. For centuries, people have sown and harvested crops, bred livestock and planned outdoor activities such as construction projects. The summer monsoon rainfall also replenishes the waterways and provides a critical supply of water for agriculture and other economic concerns.

Occasionally the rains are excessive and can cause serious and life-threatening floods. At other times a weak monsoon can cause a drought, leaving fields and waterways parched and dry. Since extreme weather conditions associated with monsoons can wreak havoc on a region's economy and people, monsoons throughout the world need to be accurately understood and predicted by weather and climate models, so that monsoon patterns can be anticipated and societies can plan accordingly.

Source of information: http://www.cpc.ncep.noaa.gov/products/outreach/Report-to-the-Nation-Monsoon_aug04.pdf

Level 3

Ask students to draw a diagram to show how monsoons can occur due to high pressure and low pressure winds.

Level 4

Solve the BLM: **Monsoon Weather Reading and Prediction – Using Maps**

LEVEL 3

MATH MANIA

Read the story 'Wild Weather' in ENGAGE magazine and fill in the blanks with relevant numbers:

1. A cyclone named Haiyan moved over the Pacific Ocean in Strong winds roared at km/hr which was faster than any other cyclone. It destroyed almost homes.
2. The Phillipines is made up of islands.
3. Nearly % of India's rain falls during the months from June to September.
4. The distance from the Gobi Desert to the United States is nearly..... kms.
5. A grain of sand ranges from to in size. Draw a sand particle of size 2 mm. Use a ruler to see how small that is!

Read the graph *How Much Rain Falls?* on page 14 of ENGAGE magazine and answer the following questions:

1. Did it rain in the month of January? In which months does it normally rain in Mumbai?

2. Which month had the highest rainfall? How much was it? _____

3. What are the maximum and minimum temperatures in the month of December? _____

4. Which month had the lowest rainfall? _____
5. What is the total amount of rain that falls in June, July, and August?

6. How do the temperatures during the monsoon months compare with the temperatures in drier months?

LEVEL 4

MATH MANIA

.....

1. Watch the video at the link http://www.diffen.com/difference/Hurricane_vs_Tornado and summarise the differences between a tornado and a hurricane based on the following parameters:

	TORNADO/TWISTER	HURRICANE/CYCLONE/TYPHOON
Life		
Size		
Warning time		
Major geographic locations		

2. The ‘Wild Weather’ segment of the magazine has several instances of using numbers. Let us analyse those numbers further.

→ In 2013, wind blew sand from the Gobi Desert over the Pacific Ocean to California in the United States, nearly 10,000 km away. So, 10,000 km = _____ metres.

→ Which is longer, a sand grain of length 2 mm or 2 cm? _____

→ Represent in numbers: 40 million years = _____

→ What is the speed range of a typhoon? _____

→ About 20% of the world’s population lives in India. What is India’s present population?

→ Draw a sand particle of size 2 mm. Use a ruler and compass to get the exact measurement.

LEVEL 4**MATH MANIA** *(cont'd)*
.....

3. The UAE weather bureau on Thursday warned of poor visibility on roads due to rising sand and dust. In a tweet, the National Centre of Meteorology and Seismology (NCMS) said there will be poor visibility, less than 2,000 metres, due to rising sand and dust in suspension over scattered areas, especially open land areas. It also said maximum wind speed was between 50 and 60 kilometres per hour, with rough seas and waves rising as high as 10 feet.

(Courtesy <http://ae.b2.mk/news/?newsid=3tp>)

This is a news report. Read it carefully and answer the following questions:

1. What is the poor visibility range mentioned in the report? _____
 2. You are stuck in a sandstorm. Which out of the following options will be helpful to you? Tick your choice/s in the box/es below.
 - Put a mask over nose and mouth.
 - Use eye glasses.
 - Move into a shelter as soon as possible.
 - Go to a high ground if possible, as sand density is maximum at ground level.
 - Drink water.
 - Stand in a group facing the sandstorm.
-

Read the graph 'How Much Rain Falls?' on page 14 of ENGAGE magazine and answer the following questions:

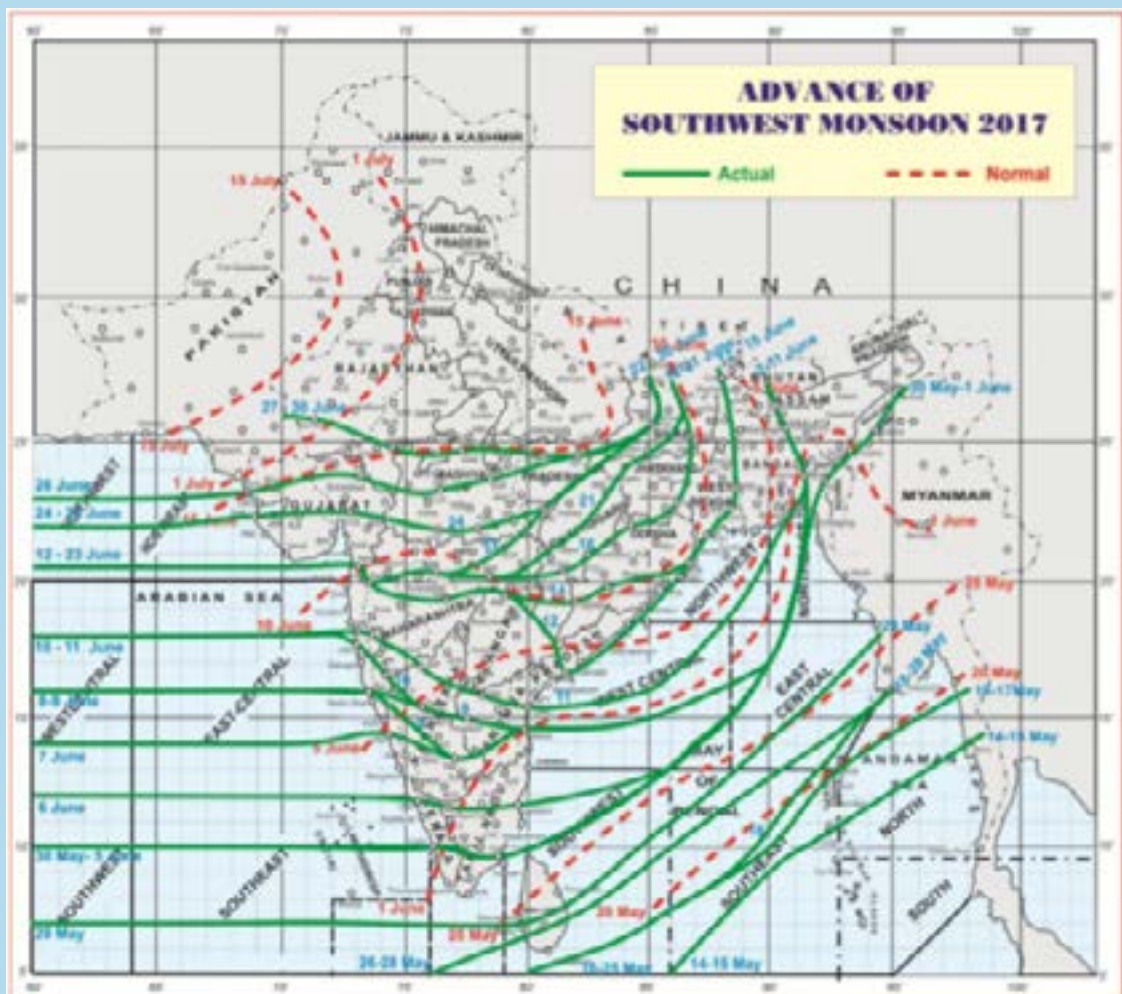
1. Did it rain in the month of January? In which months does it normally rain in Mumbai?
2. Which month had the highest rainfall? How much was it?
3. What are the maximum and minimum temperatures in the month of December?
4. Which month had the lowest rainfall?

LEVEL 4**Monsoon Weather Reading
and Prediction**

Study the map thoroughly. It is a weather update selected from updates provided by the Government of India.

How to read this map

- Observe the green bold lines and the red dotted lines.
- The **green bold** line indicates the **actual monsoon** pattern of this year.
- The **red dotted** line indicates the **predicted monsoon** pattern.
- The states of India are labelled on the map
- The graph shows the progress of the monsoon from 14–15 May to 26 June. (Observe the Y axis followed by the X axis to track the progress of monsoon from south to north.)



Courtesy http://www.cropweatheroutlook.in/crida/amis/weather_report.html

Depiction of boundaries is not authoritative.

LEVEL 4**Monsoon Weather Reading
and Prediction** *(cont'd)*
.....

On the previous page is a map showing the southwest monsoon pattern of May–June 2017 in India. Study the map carefully and answer the following questions:

1. On which date/s will the southwest monsoon hit the southern tip of India? _____

2. Tiara is a tourist who plans to visit Gujarat in the month of June. Which is the earliest date on which she will be able to watch a monsoon shower in that state? _____

3. Compare the normal and the actual monsoon patterns (observe the green/bold and red/dotted lines). In general, the monsoon this year is _____
(ahead of the normal monsoon timeline/late compared to the normal timeline).
4. By which date/s will the monsoon cross Sri Lanka completely?

5. According to the meteorological department predictions, the southwest monsoon will have mostly covered India by the date _____
6. On another sheet of paper, draw a diagram to show how monsoons can occur due to high-pressure and low-pressure winds.

Note: We incorrectly credited the sandstorm photo on page 12 (Level 3) of the magazine. It should read: **Anka Agency International / Alamy Stock Photo**

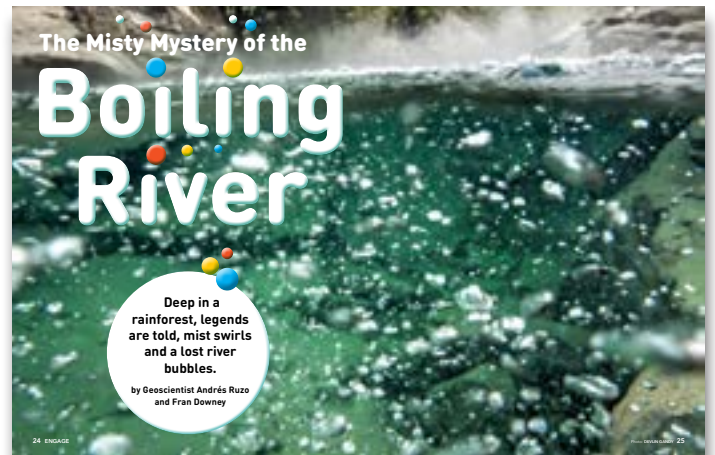
THE BOILING RIVER

LANGUAGE ARTS STANDARDS

Students will draw on a variety of comprehension strategies as needed; that is, generating and responding to essential questions.

SCIENCE STANDARDS

Students will understand how hot water bodies are created in nature.



BEFORE READING

BUILD BACKGROUND

Andrés Ruzo looks for the Boiling River. He uses a combination of ancient legends and clues he gathers along the way to reach the river. It was almost like a treasure hunt, hunting out ancient treasure with the help of clues.

- Plan a treasure hunt on similar lines to simulate the adventure for the students. Play Going on a Treasure Hunt.
- Hide a packet of treasure within the classroom. This will have to be done the day before the activity is scheduled for the students. Also place the clues before the children come into the classroom. Once the students arrive, set up the treasure hunt by explaining that long ago, an ancient people lived in the area where the school now stands. Those people hid a treasure in what is now their classroom and left clues behind. The students are explorers going on a treasure hunt to find that ancient treasure.

ACTIVITY: *Treasure Hunt*

You need:

- a packet of chocolates, which will be hidden in the classroom
- clues written on slips of paper and distributed about the classroom

To do:

1. Hide the clues around the classroom in no particular order.

2. This means that the students may have to find several clues to make sense of them.
3. Remind them that this is how science works. Scientists have to make sense out of the clues they find. They also may not find all the clues.
4. You can make up your own clues, for example: The teacher's book is your first clue. This is where she keeps a record of whether you are in school (*attendance register*).

READY TO READ

Hand out copies of ENGAGE and have students turn to page 24.

- Read the sentences using voice modulation and pronunciation.
- Ask students to read the story.
- Discuss the story using the following questions:
 1. What kind of child do you think Ruzo was?
 2. Why did Ruzo look for the river even after scientists told him it could not exist?
 3. Where is the Boiling River?
 4. What is a legend?
 5. Who are the Incas?
 6. Why did the Spanish invaders come to Peru?
 7. What heats the water in the Boiling River?
 8. According to the Incas, where did the hot water in the Boiling River come from?

- Show students the video on the link: <https://www.youtube.com/watch?v=qz1HqyE80IE>

Solve the BLM: **Comprehension Check**

AFTER READING: EXTENSION ACTIVITIES

GEOGRAPHY CONNECTION

SESSION FOCUS: EXPLORE THE AMAZON AND ANIMAL LIFE IN AND AROUND IT

- Ask students to share what they know of the Amazon River. Where is it? Why is it special? How long is it? (*It is located in South America. It runs for over 6,000 km. The Amazon is recognized as one of the longest rivers in the world.*)
- Ask students to locate the Amazon River and the Boiling River on a map of South America.

ACTIVITY:

On the map of the world ask students to mark the Amazon River.

Teacher Content reference: <http://www.blueplanetbiomes.org/amazon.htm>

- STATE: The Amazon River is home to many species of animals, including fish like the piranha and snakes like the anaconda.
- Show students clips from the video **The Amazon Aquatic Ecosystem** <https://www.youtube.com/watch?v=Vm93n9Zg-Ps>
- Ask students to focus on the scientific studies being done on the Amazon ecosystem.
- Conduct a discussion on animal and plant life in the Amazon.

ACTIVITY:

Choose any animal, bird or insect found in or around the Amazon River and research all its details. Create a poster by drawing and colouring the animal, bird or insect on an A4 sheet of paper. Write key details about the animal, bird or insect on the poster and present it to the class.

LANGUAGE ARTS CONNECTION

SESSION FOCUS: STORY READING

Read the book *Journey to the River Sea* by Eva Ibbotson.

This is the story of 13-year-old orphaned Maia, who journeys from England to relatives near the Amazon River, and her adventures en route.

SCIENCE CONNECTION

SESSION FOCUS: THE BOILING POINT OF WATER

Read the following lines from page 26 of ENGAGE magazine.

Mystery and mist shroud one of the world's deadliest rivers. The 'boiling river' of the Amazon can reach 95° C. Its waters cook anything that falls in. It is so hot that I have even used its water to make tea.

- EXPLAIN: All substances have specific boiling, melting and freezing points. The boiling point of pure water is 100°C.
- Show the following demonstration to the students:

You need:

- a small beaker
- a thermometer
- a burner and stand
- table salt

To Do:

1. Pour about 20 ml water in a beaker, place the thermometer in the beaker and record the temperature. Start heating the water and record the temperature every half-minute.
2. Ask students to record the temperatures in their notebook as you read them aloud.
3. Using the burner and stand, heat the water in the beaker. As soon as the water boils add salt to it.
4. Continue heating, stirring, observing the temperature, and recording it very half-minute until the water boils again.
5. Discuss the following:
 - What is the normal boiling point of water?
 - What happened to the boiling when the salt was added?
 - What happened to the temperature after the salt was added?

Level 4

Have students create a graph with time on the X axis and temperature on the Y axis. Then have them plot the temperature over time. They should notice that as time passed the temperature of the water increased, and then, when salt was added, the temperature dropped and the water stopped boiling.

EXPLAIN:

- The boiling point is the temperature at which a material changes from liquid to gas. We know the water is boiling when bubbles start forming at the bottom of the beaker and rise to the surface and pop. The boiling point does not change whether it is a large beaker of water or a small droplet of water.
- Boiling, melting, and freezing points are constant. They do not change unless the composition of the substance itself is changed.
- When we add salt to pure water, the water has a different composition. This new composition will have a different boiling point. As soon as salt is added to boiling water, the temperature drops and the water stops boiling. This is because salt has a lower temperature and dissolving it in water dissolves some of the heat. With the salt in the water, the water molecules adhere not only to each other, but also to the salt ions, which makes it harder to transfer the water into a gaseous state. This is why the water has to have a higher temperature to boil. The more salt, the higher the boiling temperature of the solution.
- This demonstration shows that impure water (water that contains minerals and salts) has a higher boiling point than pure (distilled) water.

Share with the students Andrés Ruzo's statement: *I found that the temperature was around 86° C. That is not quite the boiling point of water, but as water starts to scald at about 47° C, the river was dangerously hot!*

CITIZENSHIP CONNECTION

SESSION FOCUS: SAVING THE AMAZON

- EXPLAIN: The biggest threats to the Amazon River and its rainforest today is large-scale

logging of rainforest trees. When oil is drilled and piped in the rainforest, it pollutes both water and the forest. For the forest around the Boiling River, the major threat comes from deforestation (and the land and water degradation it causes).

SHARE: These threats exist not only in the Amazon but are faced by rivers and their surrounding ecology all over the world. As citizens we all can play a part in saving the world's ecology by a few simple actions:

1. Avoid buying products made from trees that grow in the rainforest, including mahogany, teak and rosewood.
2. Use recycled paper (or tree-free paper made from cotton, straw, etc.).
3. Recycle paper products at home and at school.
4. Use fewer products made from oil.
5. Walk or ride a bike whenever possible.
6. Keep petrol/diesel use to a minimum by carpooling or taking the bus.
7. Use glass instead of plastic (which is made from oil).
8. When the use of plastic bottles, utensils, etc. is unavoidable, ensure they are recycled.

You can also visit <http://www.boilingriver.org> and see how you can help in protecting the Boiling River.

CULTURAL CONNECTION

SESSION FOCUS: HOT SPRINGS IN INDIA

- SHARE: Water has always been held sacred in Indian culture. Civilisations began on river banks. India is a land of many rivers. Its geographical area is intersected by a large number of big and small rivers. Rivers are our lifeline.
- Ask students if they think that rivers are important to people and why.
- EXPLAIN: Most temples were built on the banks of rivers. Rivers like the Ganga were considered pathways to heaven. Temples were also established at times at the source of a river. For example: The Trimbakeshwar temple is located at the source of the River Godavari.

- Show this video to the students.
10 Natural Hot Water Springs in India <https://www.youtube.com/watch?v=yCDFsiF8bSY>

- SHARE an Indian legend:

In the Kullu district of Himachal Pradesh, there are well-known hot springs in the town of Manikaran, where there are also many Hindu temples and a gurudwara. According to Sikh legend, Guru Nanak came to Manikaran with his disciple Bhai Mardana. When Mardana was collecting food for the langar (community kitchen), people donated flour for rotis, but there was no fire to cook them.

Guru Nanak asked Mardana to lift a stone. When the stone was lifted a hot spring burst through. Mardana rolled the rotis and tried to cook them in the hot water, but they kept sinking. Guru Nanak sent up a prayer asking God for the rotis to float back, and he would then donate one in His name. Lo and behold! The rotis floated back.

The gurudwara at Manikaran cooks using only the heat from the boiling water that emerges from the spring. The langar is free for visitors of all faiths.

Manikaran Hot Water Geyser in Manali

<https://www.youtube.com/watch?v=gzcUDCGUDBA>

Manikaran hot spring water tea cooking

<https://www.youtube.com/watch?v=opG5sGqHwUo>

- Explain how hot springs and geysers form.
 1. Water heated below the ground rises through a crack to the surface and creates a hot spring. The water in hot springs can reach a temperature of hundreds of degrees Celsius beneath the surface. Most hot springs are cooler than geysers.
 2. Geysers, too, are created by water heated beneath Earth's surface, but geysers do not bubble to the surface — they erupt. Sometimes, when water flows through a narrow passageway underground and gets heated by magma, the heat and pressure build to so great a level that the water bursts on to the surface to create a geyser.

SHARE: Andrés Ruzo mentions in the story that you need a powerful heat source and lots of water to create a boiling river, but there are no active volcanoes near the Boiling River.

Video Hub

https://www.ted.com/talks/andres_ruzo_the_mythical_boiling_river_of_the_amazon

LEVEL 3

THE BOILING RIVER: Comprehension Check

1. Who is a geoscientist? _____

2. What does the ancient name of Boiling River mean? _____

3. Why did Andrés Ruzo need the holy men's permission to study the sacred Boiling River? _____

4. Why did geologists not agree that the Boiling River existed? _____

5. Narrate the legend of the Spanish soldiers in your own words. _____

6. In what ways did the locals use the water of the Boiling River? _____

7. Describe the flow of the river. _____

8. What lesson does Andrés Ruzo want others to learn from his quest for the Boiling River?

LEVEL 4

THE BOILING RIVER: Comprehension Check

1. Who is a geoscientist? _____

2. Why did Andrés Ruzo need the shamans' permission to study the sacred Boiling River? _____

3. Relate the legend of Paititi in your own words. _____

4. What is infrared radiation? _____

5. List the Spanish words used in the story. What does each mean? _____

6. In what ways did the locals use the water of the Boiling River? _____

7. Describe the flow of the river. _____

8. What lesson does Andrés Ruzo want others to learn from his quest for the Boiling River?
