

Earth's Processes Close-Up

TEACHER'S GUIDE

Earth's Processes Close-Up is a series of four books that explore our ever changing Earth – from its core to its rocky surface.

The Earth's Processes Close-Up Teacher's Guide provides a series of lessons developed for children in grades two and three. The lessons support essential Earth Science concepts and include hands-on investigations to build knowledge and encourage inquiry. Group activities promote brainstorming and collaboration as students become active members in their communities working to help protect Earth. The lessons challenge students to use their problem-solving, artistic, analytical, and critical-thinking skills, all while having fun and enjoying learning about Earth. Lessons support key curriculum content and include extension suggestions and assessment tools .

The lessons included are best taught in sequential order.

To begin, *Our Earth!* explores the many different landforms and key terms that identify features of Earth's surface.

Earth's Internal Structure: Draw With Me! takes a close look at what Earth is made of, challenging students to look beneath the rocky surface.

Making Waves involves creating a 'beach' in a pan, allowing children to observe first-hand the effects of waves on soil.

Wind Erosion: Model Making draws on student's sculpting expertise as they create clay models of weathered rock formations.

The *Natural Disasters* lesson involves comparing and contrasting different types of natural disasters and the effects they have on Earth.

The final lesson, *Protecting Earth*, challenges students to take ownership of the land they live upon, brainstorming ways they can protect Earth's surface right in their own backyard.

Enjoy exploring Earth and its fascinating processes with your students!

The *Earth's Processes Close-Up* series includes the following titles:

Earth's Landforms and Bodies of Water

How do Wind and Water Change the Earth?

Earthquakes, Eruptions, and Other Events That Change Earth

Protecting Earth's Surface

PACING CHART AND VOCABULARY

Lesson Plan Title	Pacing	Vocabulary
Our Earth!	1 class period*	Map Globe Mountains Valleys Landforms Model Coast Shore Delta Glaciers Ocean Geologist
Earth's Internal Structure: Draw With Me!	1 class period	Landforms Crust Mantle Outer core Inner core
Making Waves	2 class periods	Beach Sand dunes Canyons Glacier Erosion Waves
Wind Erosion Model Making	1-2 class periods	Landforms Weathering Erosion
Natural Disasters	2-3 class periods	Earthquake Tsunami Landslide Volcano geology
Protecting Earth	1-2 class periods	Brainstorming Community erosion

* 1 class period = 40-60 minutes

ACCOMMODATION STRATEGIES

Accommodations provide equal access to learning and equal opportunity to demonstrate what is learned. Accommodations allow a student access to the subject or course without any changes to the knowledge and skills the student is expected to demonstrate.

Educators are encouraged to adapt the instructional approach, activities, and assessments included in this guide to best meet the diverse interests, needs, and abilities of their students. Possible accommodations may include:

Instructional Strategies

- Provide extra time for processing of oral information
- Provide extra time for completion of tasks
- Pair oral instructions with written ones
- Pre-teach new vocabulary and regularly review previously taught vocabulary
- Provide model of completed work
- Frequently checkpoints with student to assess progress
- Provide a checklist step by step tasks for the student
- Provide several opportunities for student to ask questions

Environmental Strategies

- Proximity to teacher
- Provide a 'buddy' to assist student
- Provide an alternative setting for learning that is free from visual and auditory distractions.

Assessment Strategies

- Build in extra time to allow student to process questions asked and answers given
- Provide written instructions and rubrics for assignments
- Offer a choice of assessment activities so that the student can choose one suited to their strengths
- Space out or extend assignments to prevent student feeling overwhelmed
- Reduce the number of tasks used to assess skill or concept
- Allow students to use assistive devices or technology

LESSON 1

OUR EARTH! An Introduction

Curriculum Correlations

NGSS

Grade 2, Earth's Systems 2-ESS.1, 2-ESS2.2, 2-ESS2.3

Common Core

Grade 2, Reading Informational Text

Ontario Visual Arts

D1, D2.

Ontario Language Arts

2.3, 1.2, 1.4, 2.1, 1.8.

Ontario Science and Technology

3.4, 2.7, 2.6, 2.5.

Materials

- Smart board or projector to show a video
- Landscapes Word-Match Sheet; Blank map copies; a map; a globe.
- *Earth's Landforms and Bodies of Water*

Setting the Stage

Begin by prompting students to share what they know about Earth, encouraging them to explain what they see from the ground up.

Ask students: What do they play on outside? What is it made of? What physical aspects of the landscape do they see?

Take-away concept: Explain that these are called **landforms**; give them several examples that appear in the text. **Mountains, valleys, hills, plateaus, oceans, rivers, lakes, canyons.**

Ask the students: can you describe any of the landforms? Can you think of more landforms?

As a class, read *Earth's Landforms and Bodies of Water*, making sure to pause and answer the *What Do You Think?* Questions posed. Ask the students what **landforms** they see close to home; have them recall any landforms they've visited farther from home. Show the YouTube video listed in the back of the text under the *Learning More* section, for a kid-friendly look at landforms.

Have the students look at a map and identify where they live on the map. If there is a globe, have the students take turns looking at it, identifying where they live, and noting the different landforms visible on the globe's surface.

Ask students: How do they know where the mountains are? Where the ocean is? Where lakes are?

Objectives

Students will:

- learn about and be able to identify Earth's many different landforms.

Activity #1

Have the students complete the Word/Definition Match sheet to learn the numerous terms in this lesson. This can be completed in small groups to make it fun and encourage dialogue. The students will then get their large paper and drawing/coloring tools for creating their own Landforms Masterpiece. Instruct students to decide on what landform they would like to illustrate; it can be local, or somewhere farther away that they know of or have visited. Once it has been drawn and colored, have the groups write a short paragraph describing their image, identifying the type of landform and where it is located. Each group can then present their Masterpiece to the class.

Wrap-Up

If there are any landform illustrations farther away, see if any of the students can locate them on the map or globe in the classroom. Discuss the choices made by the groups; were there any landforms that were not illustrated? Are there any landforms that students have not seen or visited? Are there any key terms students are unsure about or need further clarification? Look at the Word/Definition Match sheet and correct it as a class. Have the students write the number of correct answers they had on the top of the sheet.

Assessment

Have the students hand in their Word/Definition sheets, after they have graded them as a class. They can be assessed on their group presentation as well, using the attached rubric.

LESSON 2

Earth's Internal Structure: Draw with Me!

Curriculum Correlations

Common Core

Grade 2, Reading Informational Text

Next Generation Science Standards

Earth's Systems 2-ESS.1, 2-ESS2.2, 2-ESS2.3

Ontario Language Arts

1.3, 1.6, 1.4, 1.8, 3.3

Ontario Science and Technology

2.5, 2.7

Materials

- Blank paper for drawing
- Pastels (or any other colouring tools)
- Large blank sheet or Bristol board for teacher
- Different colored markers for teacher
- Two apples cut in halves
- Pages 6 & 7 of *Earthquakes, Eruptions, and Other Events that Change Earth*

Setting the Stage

Hold up apple halves for students to see.

Ask Students: What parts of the apple do you see? What are they called?

Identify the parts of the apple: the core, the flesh, and the skin. Explain that our Earth has similar parts, although with different names. Have the class look at pages 6 and 7 of *Earthquakes, Eruptions, and Other Events that Change Earth*, and read together. After reading, discuss how the **Earth** has different **layers** like the apple (**inner core, outer core, mantle, and crust**)

Ask students: Do you remember what the layers of Earth are called? Invite the class to draw and label their own pictures of Earth's internal structure.

Take-away concept: Earth is similar in composition to an apple. There is more to Earth than the rocky outer crust that we can see.

Objectives

Students will:

- be able to draw and identify the internal layers of the Earth

Activity #1

The teacher will lead by drawing a large circle to represent the Earth. The class will follow; after drawing each layer, the teacher and class will label them and discuss the composition of the layer, finishing with the crust. Explain that like the apple's outer skin, the Earth's crust is the thinnest layer. Unlike the apple, Earth's crust is made of rocks and minerals and is constantly changing.

Wrap-Up

Have the students colour their illustrations, using pages 6 and 7 of their books as guidance for which colours to use.

Assessment

Assess the students' drawings, and the correct labeling of the Earth's layers using the attached checklist.

LESSON 3

Making Waves!

Curriculum Correlations

NGSS: Grade 2

Earth's Systems 2-ESS.1, 2-ESS2.2, 2-ESS2.3

Common Core

Grade 2, Reading Informational Text

Ontario Language Arts

D1, D2; 1.3, 1.6, 1.2, 1.4, 3.3.

Ontario Science and Technology

2.6, 2.7, 2.3.

Materials

- Disposable aluminum pans (you can have one to show the students, gathering them around you for the experiment, or have several and break the class into small groups, each with their own pan. Have one half of each pan filled with sand and some rocks of different sizes.
- Plastic cups used to fill the other half of the pan with water.
- *How do Wind and Water Change Earth?* text

Setting the Stage

Read through *How do Wind and Water Change Earth?* together.

Discussion Questions: What different types of water are on Earth? Students will provide a variety of answers, such as **rivers, streams, rain, oceans, waterfall, etc.**

How is water powerful? How does it change Earth's surface? (Causes **floods, tsunamis, and erosion**)

Invite the students to share their experiences with water; ask the students: Has anyone seen a **flood**? Visited the **beach**? Seen a **waterfall**? Swam in a **lake**? Encourage them to recall their observations of the water and the land around the water.

Take-away concept: Water is powerful. Water can change Earth's surface slowly or quickly. Ask students to provide an example of each.

Tell the students they are going to replicate a beach in their pan, and observe how water and waves in particular, can change the appearance of the sandy shore.

Objectives

Students will:

- learn the processes of weathering and erosion;
- view first-hand the effects of erosion on soil.

Activity #1

Once the students have formed their groups and have their materials in front of them, one student from each group can be in charge of filling up the other half of the pan with water. Have the students pat the sand side into a nice, smooth beach.

Once the other half is filled with water, have one of the group members use the spoon/spatula/hand to create gentle waves. Have them do this for a minute or so, and talk with the class about what they are observing in their pan.

Wrap-Up

Once the activity is complete, have the students line up their pans side by side to the side of the classroom, or along a ledge. Have a class discussion about observations, and compare the 'beaches' in each pan. Discuss how water is powerful enough to change the landscape; have the students draw on any prior experiences visiting a beach. Talk about **high** and **low tide (the rising and falling of the sea)**, and the different types of beaches they have visited. (Some with big waves, some with little)

Have the students return to their groups, to record their observations on the provided handout.

Assessment

Assessment through observation during the experiment; collect and grade the observation handout completed by the group.

LESSON 4

Wind Erosion: Model Making

Curriculum Correlations

NGSS

Grade 2, Earth's Systems 2-ESS.1, 2-ESS2.2, 2-ESS2.3

Common Core

Grade 2, Reading Informational Text

Ontario Visual Arts

D1.4, D1, D2.

Ontario Language Arts

1.3, 1.2, 2.3, 1.4, 2.1, 2.4

Ontario Science and Technology

2.7, 2.6

Materials

- Clay (brown or gray)
- old newspapers
- *How Do Wind And Water Change Earth?*
- Cue cards

Setting the Stage

As a class, read *How Do Wind And Water Change Earth?* Talk about the weather close to home, and how it changes the landscape. Use prompts such as: After a thunderstorm, how does it look outside? How is it different from before the rain? Is it windy during a thunderstorm? What does the **wind** do? How does it feel? What does the wind do to the schoolyard?

Encourage students to think of their yard at home and the schoolyard as well. Take-away concepts: “**weathering**,” can make slow, subtle changes, or fast, drastic changes. Give examples of slow and fast weathering (providing images would be beneficial). Returning to the topic of wind: Ask the students to recall a recess on a windy day, and how it felt. Did sand or dirt get blown into their eyes? Was litter flying around? Explain that wind transfers soil and rocks and moves them around. This is called **Erosion**. Referring to the photo of weathered rocks on page 9 of *How do Wind and Water Change Earth?* Discuss how those particles of soil and rocks wear at large landforms and create the strange shapes. (Find more images of weathered rocks for the students to view)

Pose the *What do you think?* Question listed on the bottom of page 9. View one of the slideshows or videos listed in the back of the text under “Learning More” for some great imagery on **erosion** and **weathering**.

Objectives

Students will:

- be able to describe how wind changes Earth's landscapes
- create their own model of the effects of wind erosion.

Activity #1

Post images of weathered rocks on the board, or on the projector or smart board screen. Have the students set up their rock-making station with clay on an old newspaper. Instruct the students to form their own weathered rock shape, with a written introduction on their cue card, indicating what happened to their 'rock.'

The students must explain the process of wind erosion and weathering on their card.

Once the rock formations are complete and the cards written, find a spot in the room to display student work.

Wrap-Up

Have the students be weather watchers, and on the next weather-eventful day, have them fill out their 'weather watcher' form. They will make notes on the type of weather and what they view happening to the landscape as a result. They will then list the correct key terms identifying the process.

Assessment

Assess the students' clay rock forms and introduction cue cards using the attached rubric. The students will also hand in their weather watcher forms by a determined due date for assessment.

LESSON 5

NATURAL DISASTERS

Curriculum Correlations

NGSS: Grade 2, Earth's Systems 2-ESS.1, 2-ESS2.2, 2-ESS2.3

Common Core – Grade 2, Reading Informational Text

Ontario Language Arts: 2.3, 1.2, 1.4, 2.1, 1.8.

Ontario Visual Arts: D1, D2.

Ontario Science and Technology: 2.6

Materials

- Blank paper, pencils, pencil crayons or markers
- a collection of YouTube videos may be helpful, or a video displaying the different natural disasters.
- *Earthquakes, Eruptions and other Events that Change Earth.*

Setting the Stage

Before continuing to read *Earthquakes, Eruptions and other Events that Change Earth*, prompt the students to share what they know about natural disasters.

Ask students: What is a natural disaster? What happens when there is a natural disaster? How does it affect humans?

Class discussion questions: Has anyone experienced any of the **natural disasters** spoken of? What is the closest you have come? Have you seen a bad rainstorm? High winds? Flooding?

Discuss how different parts of the country experience different natural disasters. Have there been any natural disasters in the news lately? Have you watched any movies that portrayed natural disasters?

Name the four natural disasters that the activity will be focusing on: tsunamis, volcanoes, earthquakes, and landslides.

Take-away concept: natural disasters can both build up our Earth and tear it down, with dramatic effects.

Objectives

Students will:

- learn about and be able to describe the different types of natural disasters that affect Earth's surface.

Activity #1

Tell the students they are going to make a Natural Disasters Information Chart, based on the information provided in their *Earthquakes, Eruptions, and other Events that Change Earth*. Demonstrate on a teacher copy on the board how students are supposed to set up their sheet: draw two lines down the middle of the paper, one on each side, holding the paper lengthwise; then draw four lines across. This will create a chart, one line across for each of the four natural disasters listed, with three sections each. Students will draw an example of each natural disaster in the first box; in the following box, write a description of the event, and in the third box, an explanation of what causes such an event to happen, using the key terms they have learned about. You could show a short YouTube clip at the beginning of each class, for each of the natural disasters, then allow the students time to complete that row on their chart. It may take three or four classes to complete the chart in its entirety.

Wrap-Up

The students can display their completed charts on the wall for viewing. The teacher can summarize what they have learned, emphasizing how Earth's surface can change quickly, and how natural disasters can both build up and tear down.

Extensions

There are several options for extending this lesson; with the class, complete the 'Shake it Up' experiment on page 20 of the text. For another experiment, use a baking tray and build a tower on it out of wooden blocks; explain that the tray is a tectonic plate, and when it shakes, building crumble. After the students watch the wooden tower fall easily, build another tower out of Lego, and watch how it is more difficult to crumble the Lego tower; explain that buildings need to be built stronger to withstand natural forces such as earthquakes.

Students can also go onto the website listed on page 23, for fun facts, puzzles and games for additional learning.

Assessment

The Natural Disaster charts can be graded accordingly, using the attached rubric.

LESSON 6

Protecting Earth

Curriculum Correlations

NGSS

Grade 2, Earth's Systems 2-ESS.1, 2-ESS2.2, 2-ESS2.3

Common Core

Grade 2, Reading Informational Text

Ontario Language Arts

2.3, 1.2, 1.4, 2.1, 1.8

Ontario Science and Technology

2.7, 2.6, 1.1, 1.2, 2.5

Materials

- Projector or Smart Board for showing a video
- text *Protecting Earth's Surface*
- Problem Solvers worksheet.

Setting the Stage

Class discussion: how can Earth's surface change quickly and slowly? Have them provide examples. With each example, discuss how it happens (**weathering**, from small bits of rock being blown at landforms over time; **landslides**, moving Earth from one place to another).

Ask students: What are some of the positive effects of weather changing Earth? (**erosion** brings new soil, **volcanoes** bring new mineral-rich land)

What are some negative effects? (**tsunamis** wash away homes). Be sure to pause to answer the 'What Do You Think?' questions as you come across them.

Have the students give examples of how erosion can be good and how it can be bad. Ask students: How do humans change Earth's surface? What are the negative things we do to Earth? What about positive things? You may want to show the video on coastal erosion, listed on page 23. You could also complete the 'Washed Away' activity on page 20, if students need a further example of erosion.

Take-away concept: Weather changes to Earth can have positive and negative impacts; humans change Earth too, not just the weather.

Objectives

Students will:

- learn how they can help protect Earth
- how to brainstorm collectively ways they can help in their own community, going from problem to solution.

Activity #1

Have the students form small groups, informing them they will all become 'Problem Solvers' for the time being. In their groups, have them discuss the ways they can help protect Earth's surface. As a class, go on a short walk through the schoolyard and/or neighborhood, and have the students identify signs of erosion. When they return to class, have them back in their groups with their Problem Solvers worksheet, filling out their observations and brainstorming solutions. Have them refer to their text if needed.

Wrap-Up

Once all of the Problem Solvers worksheets have been filled out, have the students present their findings to the class. As a class, discuss the findings, identifying similar or different solutions that students have come up with. As a class, visit the website listed on page 23, ecoallstarkids.com, and see if there are any additional solutions for preventing soil erosion.

Assessment

The teacher can assess the Problem Solvers worksheet and group presentation for completion. (presentation rubric attached)

Name: _____

Beach In A Pan: Observations

(The Experiment: _____)
| _____ |
| _____ /2 |
()

(The Goal: (Why are we doing the experiment?) _____)
| _____ |
| _____ /2 |
()

(What we did: _____)
| _____ |
| _____ /3 |
()

(The result: _____)
| _____ |
| _____ /3 |
()

(What did I learn? _____)
| _____ |
| _____ |
| _____ /3 |
()

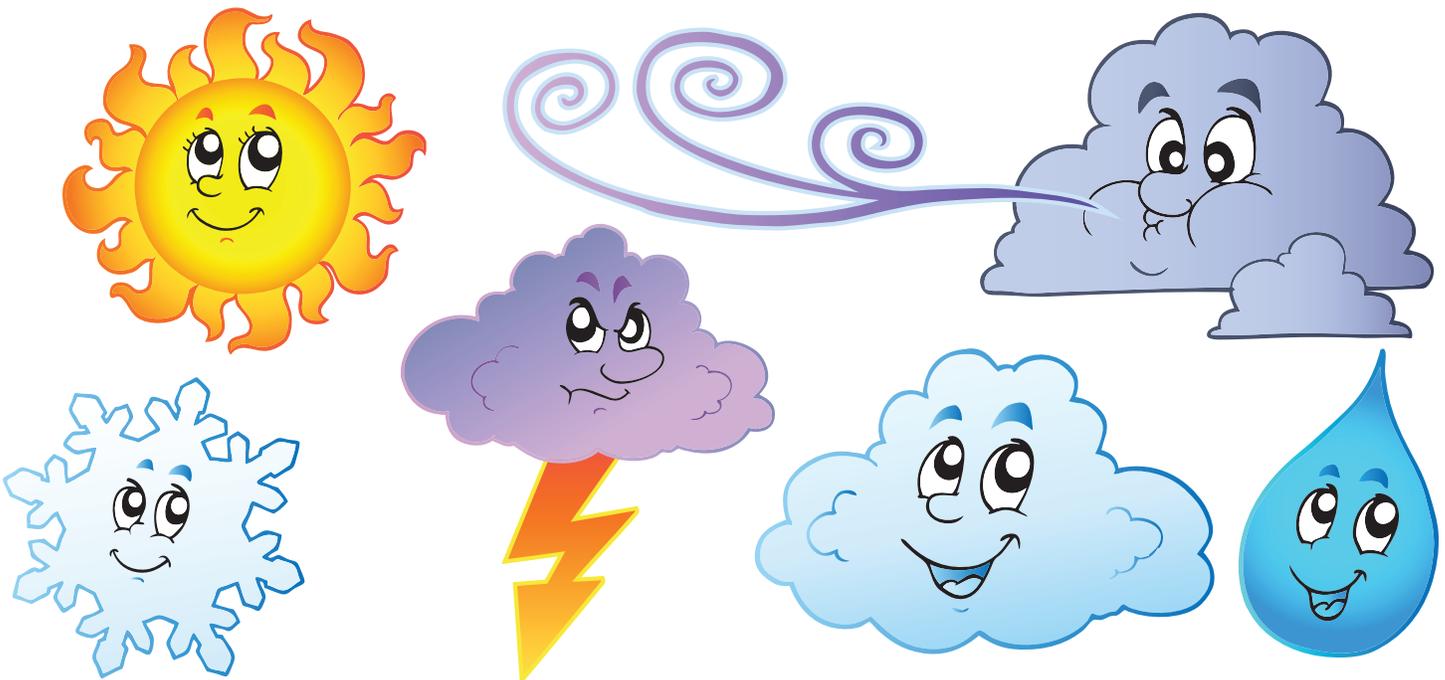
Name: _____

Weather Watchers!!

Please fill in your observations below:

What is the weather doing today? _____

How is the weather affecting the landscape? Identify what is happening, why, and what it is called, being sure to use the key terms learned in class.



Name: _____

LANDFORMS!

Match the landform with the correct definition.

A. Mountain

B. Coast

C. Valley

D. Canyon

E. Delta

F. Lake

G. Hill

H. Plain

I. Plateau

J. Stream

K. Peninsula

L. Pond

M. Ocean

N. Glacier

1. A small body of moving water

2. A large, flat area of grassy land

3. Large, deep body of salt water

4. Long and narrow body of water

5. A large body of fresh water

6. Triangle shaped area made of built up soil

7. Highest raised landform with steep, sloping sides

8. Small body of still water

9. Smaller than a mountain with a rounded top

10. Place where land meets water

11. Raised landform with steep sides, flat top

12. Narrow strip of land that juts into water

13. Thick layers of moving ice

14. Low landform between raised landforms

Name: _____

PROBLEM SOLVERS!

Match the landform with the correct definition.

PROBLEM: Erosion

Why does it happen? _____

Where was erosion identified? _____

How can we help? Possible solutions: _____



Name: _____

Earth's Internal Structure Rubric

You correctly labelled the parts of Earth

3 points: all correct

2 points: one wrong

1 point: two wrong

0 points: you did not label it

You used the correct colors on your diagram

3 points: all the colors were correct

2 points: most colors were correct

1 point: colors did not match

0 points: did not color diagram

You followed the directions & Met the Goals

3 points: all directions and goals were followed/met

2 points: most directions and goals were followed/met

1 point: some directions and goals were followed/met

0 points: no directions and goals were followed/met

Total Points: _____

Name: _____

Rubric: Natural Disasters Information Chart

	Level 1	Level 2/3	Level 4
Details	Few/no details; Inaccurate information	Some details; A few minor factual errors	Full details; No factual errors
Organization	Disorganized; Sentences don't make sense; Layout messy	Mostly organized; Makes sense Looks neat;	Very organized; Sounds great; Looks great
Word Choice	Few/No key terms used	Some key terms used, missing one or two	All key terms used
Illustration	Few details; lack of accuracy	Some details; displays working understanding	Full and accurate details; easy to identify

Name: _____

Clay with Me! Rubric

You were on Task

3 points: You were always on task

2 points: you were mostly on task

1 point: you were sometimes on task

0 points: you were not on task

Your art showed craftsmanship + creativity

3 points: your art showed excellent craftsmanship/ creativity

2 points: good craftsmanship/creativity

1 point: fair craftsmanship/creativity

0 points: unsatisfactory craftsmanship/creativity

You followed the directions & Met the Goals

3 points: all directions and goals were followed/met

2 points: most directions and goals were followed/met

1 point: some directions and goals were followed/met

0 points: no directions and goals were followed/met

Total Points:

Name: _____

Problem Solvers Worksheet & Presentation Rubric

	Level 1	Level 2/3	Level 4
Details	Few/no details; Doesn't know much about the topic	Some details; Knows little about topic	Lots of interesting details; Expert on topic!
Organization	Disorganized worksheet & presentation	Mostly organized presentation & worksheet	Very organized; Sounds great; Looks great;
Word Choice	Few/No key terms used	Some keys terms used, missing one or two	All key terms used!
Illustration	Did not come up with any solution	Came up with a good/fair solution	Excellent ideas for a solution

Name: _____

Landforms Masterpiece Artwork & Presentation

	Level 1	Level 2/3	Level 4
Detail in paragraph	Lacking detail in paragraph	Some good detail included; could expand	Interesting, descriptive, well written detail
Word Choice	Few/No key terms used	Some keys terms used, missing one or two	All key terms used!
Illustration	Poorly illustrated; no color	Good illustration; good use of color	Excellent illustration and color choice

Name: _____

Beach in a Pan Rubric

You were on Task

- 3 points: You were always on task
- 2 points: you were mostly on task
- 1 point: you were sometimes on task
- 0 points: you were not on task

You recorded your observations on the worksheet

- 3 points: clear, detailed observations were recorded
- 2 points: some observations were recorded
- 1 point: minimal observations were recorded
- 0 points: no observations were recorded

You followed the directions & Met the Goals

- 3 points: all directions and goals were followed/met
- 2 points: most directions and goals were followed/met
- 1 point: some directions and goals were followed/met
- 0 points: no directions and goals were followed/met

Total Points: