



## LESSON OBJECTIVE

- Students will understand how the geosphere, biosphere, hydrosphere, and atmosphere interact

## GRADE

- 5

## STANDARDS

- Earth and Space Science

## TIME REQUIRED

- 90-120 min

## VOCABULARY

- Geosphere
- Hydrosphere
- Atmosphere
- Biosphere

## MATERIALS

- Paper
- Colored pencils
- Pennies (approx. 5 per student)

## RECOMMENDED ASSESSMENT

- Written or oral reflection

## Introduction

Students will learn about the geosphere, biosphere, hydrosphere, and atmosphere by creating and playing a Pokémon-style battle card game to see how parts of each system interact with each other.

## State Standards

5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere.

## Lesson Plan

### Background Knowledge –

- Geosphere*: the solid parts of a planet like the mantle and crust. This also includes solid and molten rock, soil, and sediments.
- Hydrosphere*: all of the waters on the earth's surface, such as lakes and seas, as well as groundwater held in soil and rock and water frozen in ice.
- Atmosphere*: the gas and air envelope that extends from the ocean and land surface of a planet outward into space. It makes life possible by providing us with air to breathe, shielding us from UV radiation from the sun, and trapping heat to warm the planet.
- Biosphere*: the regions of the surface occupied by living things, including humans.

### Activity –

- The earth's spheres interact with each other in various ways. A river can move sand particles, the wind can cause trees to bend, and humans can impact the earth by mining for minerals or cutting down trees. They are all connected! We're going to look at how different aspects of each sphere can impact each other.
- Students will be designing a deck of 30 cards by using the provided list of suggestions. They will choose what cards they want to have as part of their deck, draw and color – them, and then use their completed decks to have a Pokémon-style battle.
- Students will choose some "characters" who will engage in battle against each other. They will also want to make some "energy" cards to help power-up their attacks so they can do more damage when they

attack. Lastly, they can choose to add some “action” cards so they can make some extra special moves during the battle. Students can choose how many of each type of card they want in their deck; suggestions for optimal game play are listed in the student guide. Going outside of the suggested number of each type of card may make game play more difficult.

4. Pass out student guide and blank card templates so students can begin creating their cards. Go over this guide with students.
5. Once students have chosen their characters and started working on their cards, game play can be explained.

Game Play: Each student will shuffle their deck and find a partner to play against. They will draw 5 cards from their deck to start with in their hand and place 1 Character card facedown in front of them so their opponent cannot see it (this is their active card for battle). If a student does not have a character card in their hand, reshuffle and draw 5 again.

Decide who will go first. Player 1 will:

- Draw 1 card from their deck
- Decide if they want to add a character, also face down, to their bench of characters waiting for their turn for battle (these characters will be “on deck” and into battle in the event their active character is defeated)
- Decide if they want to attach a single energy card to either the active character or a benched character
- Decide if they want to use an action card
- Attack their opponent

Players will attack by saying, “I choose (character name here) !” and reveal their attacking card. Their character card will have an attack on it with an amount of damage that it does to their opponent. This will take away part of their opponent’s health. The player who is attacked will add damage counters (pennies) to their own active character. When a character’s health is down to zero, that character faints and is considered defeated (place defeated characters off to the side turned 90 degrees). For example, a character may have a health of 5. If that attack does 2 damage, then they will add 2 pennies to their card to show they have damage, and their new health will be 3.

If the attacker has an energy card attached to their character, then that character does double the amount of damage to their opponent.

After attacking, player 1’s turn is over and player 2 will begin their turn, following the same sequence of drawing a card, deciding if they want to add to their bench, deciding whether to attach a single energy card, and deciding if they want to use an action card. They can then attack their opponent. The game is over when a player has no cards left to play, when a player



# Battle of the Spheres



has had all of their characters defeated, or when they are left with a hand of all energy and action cards and no benched characters to battle with.

### Post-Battle Activity –

Wrap-up with a discussion. Ask students:

- How did your characters interact with your opponent’s characters? Were any of your characters weaker to any of theirs? Why was that?
- What were some of the ways yours were able to influence theirs?
- Were their characters able to do anything to yours that you couldn’t stop? Why was that?
- Think about two of the characters you were battling against each other. Is that battle something that could happen in real life? What would the outcome be?

### Discover Further

#### Extending the Lesson –

Have students glue their completed cards to construction paper, cardstock, or scrapbook paper and then laminate them to make a more permanent deck.

Each time a student uses an attack, have them explain how it works against their opponent’s sphere or affects their opponent’s specific character. If there are any attacks that they don’t know the definition of, have them research those attacks so they can explain them to their opponent.

#### Learn More –

The interaction between Earth’s different spheres is a major consideration at the zoo. Some animals like to dig and need specific soils, some aquatic animals need land space, some animals need specific plants to grow in their enclosures, and all of them have specific temperature, water, and oxygen requirements. The Fort Wayne Children’s Zoo designs our habitats to match where that animal would live in the wild, and often has to make adjustments when our Indiana weather doesn’t do what we expect. Come learn more about our exhibits and how we design them with our animals in mind by attending our weekly keeper chats at the Fort Wayne Children’s Zoo!

|               |                          |
|---------------|--------------------------|
| Ocean         | Double Damage            |
| Arctic        | Search                   |
| Glacier       | Extra Attack             |
| Glacier       | Biodiversity             |
| Groundwater   | Energy Boost             |
| Stream        | Energy Boost             |
| Lake          | Natural Disaster         |
| Lake          | Pollution                |
| Precipitation |                          |
| Precipitation | 7 Biosphere Energy Cards |
| Water Vapor   |                          |
| Waterfall     |                          |
| Waterfall     |                          |

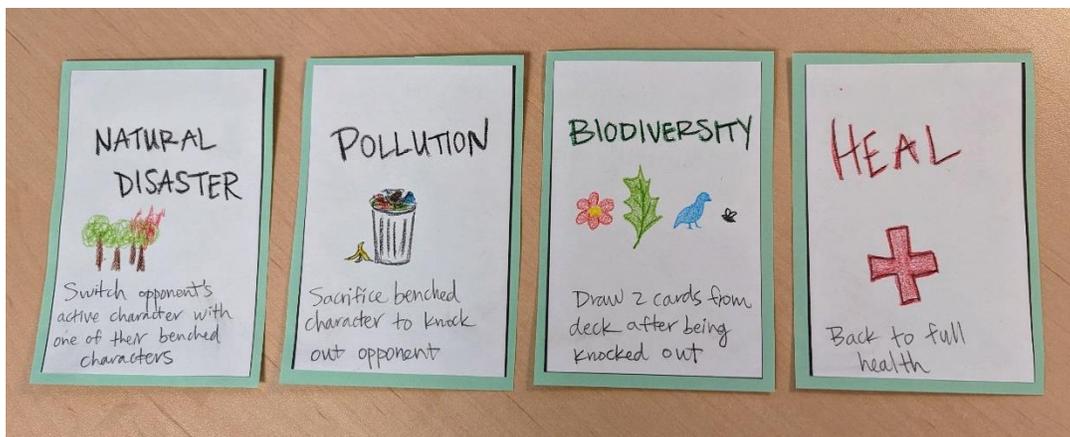
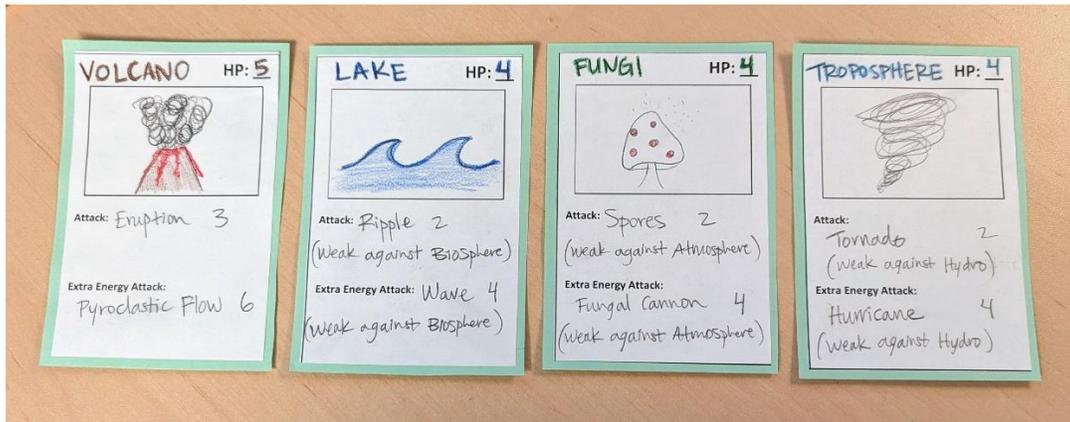


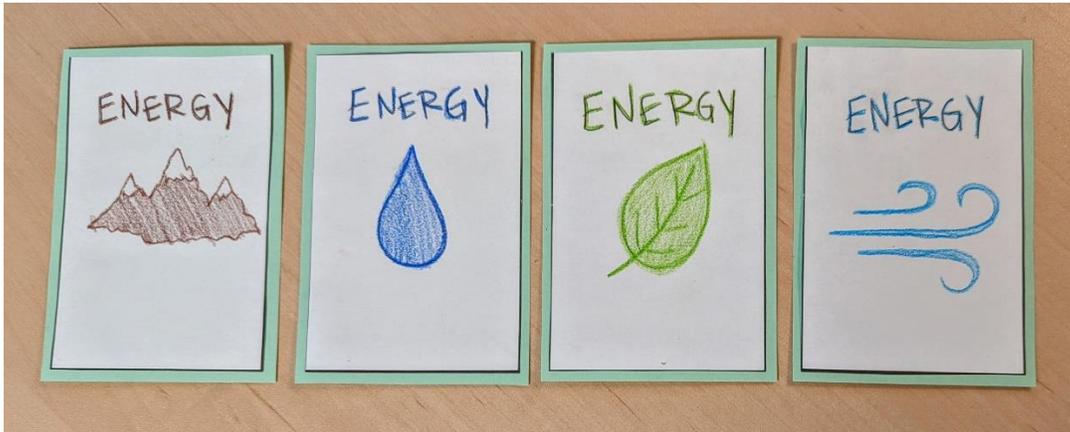
Example Decks –

|              |                          |
|--------------|--------------------------|
| Human        | Heal                     |
| Animal       | Extra Attack             |
| Fungi        | Climate Change           |
| Fungi        | Double Damage            |
| Bacteria     | Double Damage            |
| Tree         | Energy Boost             |
| Microbe      | Retreat                  |
| Microbe      |                          |
| Gravel       | 6 Biosphere Energy Cards |
| Lava         | 4 Geosphere Energy Cards |
| Soil         |                          |
| Earth's Core |                          |
| Mud          |                          |

|             |  |
|-------------|--|
| Waterfall   |  |
| Evaporation |  |

Example Cards –





## Student Guide – One Per Table Group

Your deck will contain 30 cards. You can choose how many of each type of card you want, but we recommend:

12-15 Character Cards

7-10 Action Cards

5-11 Energy Cards

You can choose all characters from 1 sphere or characters from multiple spheres, but the more spheres you have represented in your deck, the more types of energy cards you will need to power up their attacks. Many players choose to only have characters from 1 sphere or 2 spheres.

You can have multiples of some characters in your deck unless they are a rare character, and then you can only have 1. If your character's attack is weak to characters from a specific sphere, it will only do  $\frac{1}{2}$  damage to that character.

1. Choose Your Characters (12-15).
2. Choose Your Action Cards (7-10):
  - DOUBLE DAMAGE – this card does double damage if played against a RARE character.
  - POLLUTION – sacrifice one of your benched characters to knock out your opponent, even if it is a RARE character.
  - HEAL – use this card to heal your active or just knocked out character back to full health.
  - EXTRA ATTACK – use this card to take an extra attack turn.
  - SEARCH – this card allows you to search your deck and draw 1 card of your choosing out to add to your hand. Shuffle your deck afterward.

- SEE THE FUTURE – this card allows you to look at the top 5 cards of your deck. You can choose to put them back on top or shuffle your deck.
- BIODIVERSITY – if you just had a character defeated, use this card to draw an extra 2 cards from your deck.
- RETREAT – use this card to take your active character back into your hands. Every round it is out of play, it will heal 1 HP.
- ENERGY BOOST – use this card to take an energy card from a knocked out character and give it to your active or benched characters.
- CLIMATE CHANGE – this card changes your opponent's attack to hurt themselves instead of you.
- NATURAL DISASTER – the balance of the ecosystem has changed. Switch one of your opponent's benched character with their active character.

### 3. Create Your Energy Cards (however many you have left):



| Sphere    | Character      | HP | Attack                                | Damage | Attack With Energy Card                          | Damage |
|-----------|----------------|----|---------------------------------------|--------|--|--------|
| Geosphere | Volcano (RARE) | 5  | Eruption                              | 3      | Pyroclastic Flow                                 | 6      |
| Geosphere | Mountain       | 3  | Slump                                 | 1      | Landslide  | 2      |
| Geosphere | Sand           | 4  | Sandstorm (weak against Atmosphere)   | 2      | Dust Storm (weak against Atmosphere)             | 4      |
| Geosphere | Rock           | 3  | Rock Fall                             | 1      | Rockslide  | 2      |
| Geosphere | Gravel         | 4  | Weathering (weak against Biosphere)   | 2      | Erosion (weak against Biosphere)                 | 4      |
| Geosphere | Lava           | 4  | Lava Flow (weak against Hydrosphere)  | 2      | Lava Flood (weak against Hydrosphere)            | 4      |
| Geosphere | Soil           | 4  | Creep (weak against Biosphere)        | 2      | Debris Flow (weak against Biosphere)             | 4      |
| Geosphere | Mud            | 4  | Mudslide (weak against Hydrosphere)   | 2      | Mudflow (weak against Hydrosphere)               | 4      |
| Geosphere | Earth's Core   | 4  | Magma Plume (weak against Atmosphere) | 2      | Magnetic Pole Reversal (weak against Atmosphere) | 4      |
| Geosphere | Earth's Crust  | 3  | Earthquake                            | 1      | Tsunami  | 2      |

| Sphere      | Character     | HP | Attack         | Damage | Attack With Energy Card | Damage |
|-------------|---------------|----|----------------|--------|-------------------------|--------|
| Hydrosphere | Ocean         | 3  | Tropical Storm | 2      | Hurricane               | 1      |
| Hydrosphere | Arctic (RARE) | 5  | Iceberg        | 3      | Ice Sheet               | 6      |

|             |               |   |  |   |                                       |   |
|-------------|---------------|---|--|---|---------------------------------------|---|
| Hydrosphere | Glacier       | 4 | Crevasse (weak against Geosphere)      | 2 | Calving (weak against Geosphere)      | 4 |
| Hydrosphere | Groundwater   | 4 | Runoff (weak against Geosphere)        | 2 | Liquefaction (weak against Geosphere) | 4 |
| Hydrosphere | Stream        | 3 | Erosion                                | 1 | Cut Bank                              | 2 |
| Hydrosphere | Lake          | 4 | Ripple (weak against Biosphere)        | 2 | Wave (weak against Biosphere)         | 4 |
| Hydrosphere | Waterfall     | 4 | Plunge Pool (weak against Biosphere)   | 2 | Canyon (weak against Biosphere)       | 4 |
| Hydrosphere | Precipitation | 3 | Flood                                  | 1 | Flash Flood                           | 3 |
| Hydrosphere | Evaporation   | 4 | Dew (weak against Atmosphere)          | 2 | Humidity (weak against Atmosphere)    | 4 |
| Hydrosphere | Water Vapor   | 4 | Thunderstorm (weak against Atmosphere) | 2 | Super Cell (weak against Atmosphere)  | 4 |

| Sphere     | Character           | HP | Attack                                   | Damage | Attack With Energy Card                           | Damage |
|------------|---------------------|----|--|--------|---|--------|
| Atmosphere | Wind                | 3  | Breeze                                   | 1      | Squall  | 2      |
| Atmosphere | Air                 | 4  | Fog (weak against Biosphere)             | 2      | Gale (weak against Biosphere)                     | 4      |
| Atmosphere | Troposphere         | 4  | Tornado (weak against Hydrosphere)       | 2      | Hurricane (weak against Hydrosphere)              | 4      |
| Atmosphere | Atmospheric Gas     | 4  | Oxygen Shortage (weak against Geosphere) | 2      | Carbon Dioxide Poisoning (weak against Geosphere) | 4      |
| Atmosphere | Stratosphere (RARE) | 5  | Jet Stream                               | 3      | Ozone   | 6      |
| Atmosphere | Mesosphere          | 4  | Meteor (weak against Biosphere)          | 2      | Meteor Shower (weak against Biosphere)            | 4      |
| Atmosphere | Thermosphere        | 3  | Aurora Borealis                          | 1      | Magnetic Storm                                    | 2      |
| Atmosphere | Exosphere           | 3  | Shooting Stars                           | 1      | Vacuum of Space                                   | 2      |
| Atmosphere | Ionosphere          | 4  | Satellite (weak against Hydrosphere)     | 2      | Solar Radiation (weak against Hydrosphere)        | 4      |
| Atmosphere | Sun                 | 4  | Sunburn (weak against Geosphere)         | 2      | Heat Stroke (weak against Geosphere)              | 4      |

| Sphere    | Character    | HP | Attack       | Damage | Attack With Energy Card | Damage |
|-----------|--------------|----|--------------|--------|-------------------------|--------|
| Biosphere | Human (RARE) | 5  | Construction | 3      | Resource Extraction     | 6      |

# Battle of the Spheres

|           |          |   |   |   |  |   |
|-----------|----------|---|---|---|--|---|
| Biosphere | Animal   | 4 | Dig (weak against Geosphere)                | 2 | Build (weak against Geosphere)           | 4 |
| Biosphere | Plant    | 4 | Invasive Species (weak against Hydrosphere) | 2 | Super Invader (weak against Hydrosphere) | 4 |
| Biosphere | Insect   | 3 | Swarm                                       | 1 | Plague                                   | 2 |
| Biosphere | Fungi    | 4 | Spores (weak against Atmosphere)            | 2 | Fungal Cannon (weak against Atmosphere)  | 4 |
| Biosphere | Bacteria | 3 | Disease                                     | 1 | Infection                                | 2 |
| Biosphere | Amoeba   | 3 | Oozing                                      | 1 | Parasite Infection                       | 2 |
| Biosphere | Algae    | 4 | Algal Bloom (weak against Geosphere)        | 2 | Red Tide (weak against Geosphere)        | 4 |
| Biosphere | Microbe  | 4 | Decomposition (weak against Hydrosphere)    | 2 | Rapid Growth (weak against Hydrosphere)  | 4 |
| Biosphere | Tree     | 4 | Photosynthesis (weak against Atmosphere)    | 2 | Oxygen (weak against Atmosphere)         | 4 |