Would You Like A Desert With That?
Part I

Abstract: In this lesson we will be covering the four different deserts in the United States and their characteristics.

Grade Level: 3rd

Utah State Core Curriculum Standards:
Standard II
• Students will understand that organisms depend on living and nonliving things within their environment.

Benchmark
• For any particular environment, some types of plants and animals survive well, some survive less well and some cannot survive at all. Organisms in an environment interact with their environment. Models can be used to investigate these interactions.

Objective
• Students will be able to understand what a desert is and the characteristics of a desert.

Instructional Time: 1-2 days

Materials:
• The Magic School Bus Gets All Dried Up (A Book About Deserts)
• Map of the United States with Desert locations
• Cactus Hotel by: Brenda Z. Guiberson
• Information Wheel for each student
• Heart of the Desert Wild by: Greer K. Chesher
• Variety of desert books from your local library

Terminology:
Arroyo: A dry desert gully.
Bajada: A broad, sloping depositional deposit caused by the coalescing of alluvial fans.
Desert: Receiving less than 10 inches of precipitation annually.
Mesa: Broad, flat-topped hill rounded by cliffs and capped with a resistant rock layer.

Intended Learning Outcomes:
• Manifest science interests and attitudes.

Background Information: Use these websites to find more information about the different living organisms that live in the desert http://www.desertusa.com/animal.html &
http://www.desertusa.com/flora.html (you will need this for part 2 in the procedures). See procedures for additional background information.

**Invitation to Learn:** The Magic School Bus Gets All Dried Up (A Book About Deserts)

**Prior Knowledge Assessment:**
Have an open ended discussion using these questions as prompts,
- What is a desert?
- Do we live in a desert?
- Do we have deserts in the United States?
If the students have no knowledge of what a desert is then explain the different characteristics of a desert (hot, dry, animals etc). If the students do have some prior knowledge move on to the procedure section

**Procedures:**
Ask the students why they think it is important to know what a desert is. One example might include we live in a desert and knowing that it is important that we conserve water.

1st Discuss the four different types of deserts in United States and their characteristics, and show map
- **Chihuahuan**
  - referred to as a “hot desert” because of their high temperatures in the summer, and because of the different types of plants (subtropical origin)
  - largest desert in North America
  - lies south of the international border
  - locations in the United States extend into parts of New Mexico, Texas and sections of southeastern Arizona.
  - less than 10% of rainfall a year (most of this precipitation happens in the summer, little in the winter)
- **Sonoran**
  - referred to as a “hot desert” because of their high temperatures in the summer, and because of the different types of plants (subtropical origin)
  - locations extend in southwestern Arizona and southeastern California, as well as most of Baja California and the western half of the state of Sonora, Mexico.
  - this is the hottest of the four North American deserts
  - freezing conditions can occur a few nights in the winter
- **Mojave**
  - referred to as a “hot desert” because of their high temperatures in the summer, and because of the different types of plants (subtropical origin)
  - location of this desert extends to southeastern California and portions of Nevada, Arizona and Utah, continues to the northwestern side of the Sierra Nevada range to the
Colorado Plateau in the east; it abuts the San Gabriel-San Bernardino mountains in the southwest
- Near the Great Basin-Mojave border lies Death Valley
- extreme variations in daily temperature
- less than 5% of precipitation a year
- Almost all the precipitation arrives in winter.
- Freezing temperatures occur in winter, while summers are hot, dry and windy.

- **Great Basin**
  - referred to as “cold desert” because it is usually cooler than other deserts in the summer, because of the different types of plants (no-subtropical origin plants, usually shrubs)
  - largest U.S. desert
  - bordered by the Sierra Nevada Range on the west and the Rocky Mountains on the east, the Columbia Plateau to the north and the Mojave and Sonoran deserts to the south.
  - 7-12 inches of precipitation annually, evenly distributed throughout the year

2nd Discuss some of the living things in a desert (eg. plants and animals etc.)
Ask the students what types of living organisms they think might live in a desert?
**Example 1:**
Name: Cottontail
**Habitat,** can they live in the desert? Yes (desert like grasslands and shrublands)
**Brief Description:** light in color ranging from tan to gray, tail is rounded, 13-17 inches long ears are about 3-4 inches long, weight is about 2-3 pounds, females are larger than male, etc.

**Any other information about the particular living organism that is interesting**
**Example 2:** You could have the students draw a picture of the living organism and just talk about it
You can get additional information on this by using the websites provided in the background info.

3rd Make an emphasis on the Great Basin being located in Utah

4th Have students create an information wheel on the four different deserts (see attachment)

5th Allow students to look at the different desert books

**Adaptations and Modifications for Special Learning Needs:** Make any adaptations needed according to the needs of the students in the classroom. A suggestion might be to have a movie on deserts.

**Assessment:**
- Have students create a journal entry on their perception of what a desert is (this can be in written or visual form). Their entry must include at least 3 characteristics of what a desert is.
Preview to next lesson: Animals in the desert (living organism cont.)

References:
http://www.desertusa.com/index.html

http://mbgnet.mobot.org/sets/desert/ofworld.htm
Attach with a Brad of dot.

Place wheel A on top of wheel B.

Cut on the dotted line.

Desert Pact Wheel A
Desert Fact Wheel B

Chihuahuan

Great Basin
Abstract A: This is the second part of the unit; therefore students will have a basic understanding of different kinds of deserts, animals, and bugs within these deserts. Students will get a hands-on experience by setting up a terrarium of native and non-native plants of deserts (particularly Utah plants) and predicting which plants will survive under similar heat conditions of a desert.

Grade Level: 3rd

Instructional Time: 40-45 minutes
This time is for the set up of the experiment. Observations will extend to a week.

Standard II: Students will understand that organisms depend on living and nonliving things within their environment.

Objective 1: Classify living and nonliving things in an environment.
   a. Identify characteristics of living things (i.e. growth, movement, reproduction)
   c. Classify living and nonliving things in an environment.

Intended Learning Outcomes:
- Students will use their science process and thinking skills to predict an outcome of living things within a desert ecosystem.
- Students will observe simple objects and patterns of different plants.
- Students will report observations by drawing pictures of the plants and writing descriptive word to explain the characteristics of the plant they choose.
- Students will be able use observations to construct a reasonable defense behind their predictions using characteristics of the plants as proof.
- Students will communicate effectively by using terms such as; prediction, climate, ecosystem, adaptation and annual to explain the science project at hand.

Materials:
- Terrarium
- Plants:
  - (2-3) Native plants. To get a list of Utah’s native plants go to: http://extension.usu.edu/files/natrpubs/despub.pdf (example: Sego Lily)
  - Or http://www.unps.org/
  - (2-3) Non native plants:
    - African violets, Cyclamens, Ferns, Ivy, Creeping Figs
- heat lamp
- science journals/worksheet
- Popsicle sticks
- glue
- writing utensils
- ruler
- calculator
- thermometer

**Terminology:**
- Ecosystem- a localized group of interdependent organisms together with the environment that they inhabit and depend on.
- Adaptation- the process or state of changing to fit new circumstances or conditions, or resulting in change.
- Precipitation- rain, snow, or hail; all of which are formed by condensation of moisture in the atmosphere and fall to the ground.
- Annually- every year or once a year
- Prediction- making a statement or forming an opinion about what will happen in the future.
- Climate- the average weather over a period of years within a given place.

**Background information:** Many of the non-native plants of Utah you can find at any nursery. Choose plants that are more like ferns, impatiens, etc., and make sure that you chose one budding plant that will survive in the desert/ one that will not. More background information concerning soil and planting is expressed in more detail within procedures section. A great place to get these plants, especially cacti type vegetation is:

![CACTUS & TROPICALS](2735 South 2000 East – Salt Lake City – Utah – 801. 485. 2542 – 801. 487. 7478 fax)

**Invitation to learn:** What type of ecosystem do we live in? Can anything survive in this ecosystem?

**Prior Knowledge Assessment:** Review the growth of plants; what they need? How do plants grow? What are the important things that plants need to grow? Students should be able to make the connections of learning about plant life cycle in the second grade. If not briefly go over how plants need soil, water, and sun to live and grow. Do you think that any plant can grow here in Utah? Take a vote of student’s hands that say yes and say no. Write this on a piece of paper to show at the end of the experiment.

**Procedures:**

Step 1: Information
Connect your pre-assessment of water and sun being used for plant food to the amount of sun and water a desert gets. Ask the students, based off of what they learned about deserts if there is more sun or more water? Define precipitation on the board and explain how much a desert gets in a year: Precipitation averages 7-12 inches annually/ minimum of 9 cm- 46cm a year. Define annually on the board. [www.ucmp.berkeley.edu/glossary/gloss5/biome/deserts.html](http://www.ucmp.berkeley.edu/glossary/gloss5/biome/deserts.html)
Ask the students how much water that would be in a month? How much would that be in a day? First divide 12 inches by 12 days. Then divide 12 inches by 365 days. Show this amount on a ruler, or draw a line across the board showing this amount. Explain that plants that do survive in the deserts have to adapt to the dry climate. Define climate and adaptation on the board.

Step 2: Introduce Experiment
Tell the students that they are going to make a “desert like” ecosystem made up of plants and soil. Introduce the plants and have four- six students make signs for the plants, in order to label them in the terrarium. Explain what they are predicting: putting plants in a terrarium and seeing if they can survive the dryness and heat that you will find in a desert. They will pick one plant that they think will adapt to the heat lamp (hot sun) and survive. Why? Students will make predictions based on the way the plant looks. They will write down the characteristics of the plant they chose and give a reason why they think “that” plant will survive. The will do this on a worksheet passed out. They will staple these sheets in their science journals when they are finished. Question: Which plant will adapt to the dry heat in the terrarium? Why? Make sure to write an example of a plant that you chose in a sentence appropriate for a prediction: I think “so and so” plant will adapt to the dry heat and survive because it ________.

Step 4: Hand out the prediction worksheet. Explain that students need to make predictions based off of reasoning, or observations. Explain the importance of defending their choice. Have student draw the stem, leaves, flowers, etc. Have them draw the shape of the leaves (using models attached for reference). Have them write down the color and texture of the plant. When the students are finished with their predictions, move to the next step.

Step 5: Set Up Experiment
Ground- potting soil, gravel, and sand.
Directions- mix soil, gravel and a little bit of sand together and layer on bottom. Plant your 4-6 plants in the soil. Cover with a layer of sand.
www.uen.org/Lessonplan/preview?Lpid=618 Mini-Ecosystems
Plant the plants a good distance apart. Be sure to plant a native plant closer to the wall of the terrarium so that students can make observations about the roots.
Place the plant signs made in class next to the plants for identification.
Cover the top of the terrarium with a screen, placing a heat lamp over the top. Make sure to put a thermometer in the terrarium and try to regulate the temperature of this mini-ecosystem to average 95 degrees Fahrenheit. For more information on temperature see: http://www.usoe.k12.ut.us/curr/science/core/4th/4thSciber/enviro/html/desert.htm

Step 6: Have the students take a good look at the terrarium you just made. Have them write down some final thoughts and observation of the ecosystem they just produced. Present the students with the question: What are the living and non-living things in this terrarium? Name at least one living and one non-living thing that you will find in the desert. Write any questions that they have about the experiment in their journal.

Conclusion: Review with the students the characteristics of a desert environment: hot and dry. Go over the needs of the plants; sun, water, and soil. Explain how plants and soil work together to help the plant grow. Show how the roots of the plants interweave through the soil. Why? The plants use their roots in the soil to get water to grow. Ask the student if we have all the elements
in the terrarium that makes an accurate representation of desert ecosystem. Sun-yes!, Sand-Yes!, living things-yes!

**Adaptations and Modifications for Special Learning Needs:**
- ELL Students can write their observations in their language.
- Students who are extremely slow at writing can use pictures to express predictions.
- Make signs in terrarium in different languages
- Other adaptations make accordingly.

**Assessment:**
- Students are staying on task and able to ask relevant questions about the experiment.
- Students write a clear prediction and back it up with facts of why they chose a given plant. Student’s description of plants includes the shape of leaves, flower, color, texture, and size of the plant. You should be able to pick the plant without looking at the name.

**Resources:**
  A published work *Deserts Plants of Utah* by Berniece A. Anderson. Everything you would need to know about desert plants in Utah! A must see!
- [http://www.unps.org/](http://www.unps.org/)
  Utah Native Plant Society provides you with many plants to buy, native to our wonderful Utah soil.
- [www.ucmp.berkeley.edu/glossary/gloss5/biome/deserts.html](http://www.ucmp.berkeley.edu/glossary/gloss5/biome/deserts.html)
  *The Desert Biome* allows a brief introduction into the different kinds of deserts. If you need a brief description of deserts, this is the place to visit.
- [http://www.uen.org/Lessonplan/preview.cgi?LPid=618](http://www.uen.org/Lessonplan/preview.cgi?LPid=618)
  *Mini-Ecosystems* lesson plan by Jennifer Edwards that will give a jump start into starting your own little ecosystem for your classroom.
  This site is named “Utah’s Hot Desert”, yet you will find links to the water cycle, fossils, rocks and minerals, Utah’s plants and animals, and weather observations. This is a great website for wonderful lesson ideas and activities concerning deserts.

![CACTUS & TROPICALS](image)

A local business here in Utah that provides a variety of healthy plants and a knowledgeable staff to help you out.

**Additional Reading:**
• *Voice of the Desert* and *The Desert Year* by Joseph Wood Krutch
• *Wind in the Rock* and *Run River Run* by Ann Zwinger
• *The Mysterious Lands* by Ann Zwinger
Question: Which plant do you think will adapt to the hot terrarium and survive?

Prediction: (I think….. because…..)

Name of Plant: ____________________________

Why did you choose this plant?

Leaves: Shape/Color

Height of plant?

Texture:

Is there a flower?
Part III: Sand Centers, Exploring

Abstract: In this lesson students will learn about the nonliving elements within a desert ecosystem. They will make connections of how nonliving is just as important as living things within an ecosystem and understand how they rely on each other for survival.

Grade Level: 3rd

Instructional time: 40-45 minutes

Standard II: Students will understand that organisms depend on living and nonliving things within their environment.
  Objective 1: Classify living and nonliving things in an environment
    a. Identify characteristics of nonliving things.
  Objective 2: Describe the interactions between living and nonliving things in a small environment.
    e. Pose a question about the interaction between living and nonliving things in the environment that could be investigated by observation.

Intended Learning Outcomes:
- Students will be able to sort and sequence data according to given criterion by filling out each section of the “Sand Centers” worksheet.
- Students will compare things by showing the difference between living and nonliving things within the desert.
- Students will report observations at each center with pictures, sentences, and models.
- Students will use available references; book, microscope, rocks, sand, to obtain information about nonliving things.

Materials:
- Sandstone
- Shale
- Chert
- Journals
- Pencil
- Rock/Sand worksheet
- Sand
- Soil mixture used in terrarium
- Sand book by Margaret Clyne and Rachel Griffiths
- 2 microscopes
- Petri dishes

Terminology:
Sedimentary rocks – form deposits that accumulate on the Earth’s surface. They are a layering or bedding that is made up of pre-existing rocks that have been depressed and trapped.
Rocks- any consolidated material such as granite or limestone, or unconsolidated material such as sand or mud, consisting of more than one mineral and sometimes organic material.
Weathering- the disintegration and decomposition of rocks and minerals by natural process of prolonged exposure to weather.

Minerals- an inorganic substance in nature that occurs naturally in rocks and in the ground: has its own characteristic appearance and chemical composition.

**Background Information:** The soil used in the terrarium is a mixture of sand and regular soil. This is due to the fact that most soil in Utah deserts has a high concentration of sand, silt, clay, and quartz minerals in them. This may need explaining to students in the third center.

**Prior Knowledge Assessment:**
The previous day students wrote down any questions in their journal concerning the setting up of the plant experiment. Address these questions will give the teacher a good indicator if they understood the idea of plants needing food, water, and soil to survive. Ask the students if all of these elements are living? When they recognize that soil is not living, you can then move on to your lesson of nonliving things in Utah deserts.

**Procedure:**
Step 1: Tell the students that they are going to explore the nonliving things that make up the deserts of Utah. This will be done within three centers. Students will get 10-15 minutes at each center. Point of each center is to fill out the given questions on the worksheet handed out.

Step 2: Model what needs to be done at each center before setting the students on their own.

Step 3: Pass out worksheet. There will be three sections to this worksheet that will require answer from the three science stations. These stations will be sedimentary rocks, how sand is made, and an up-close and personal look at sand.

- **Station 1: Sedimentary Rocks.**
  
  **Materials:**
  
  - Information sheet of what sedimentary rocks are
  - Sandstone, Shale, and Chert rocks
  - Information cards for each rock
  - Worksheet
  - Instruction card

  This center each student is going to put a one –to- two sentence summary of what sedimentary rocks are. They will then draw pictures of the different rocks placed at the center. They will write down the name, one interesting fact, and description of the rocks. The students will also see if the rock has the ability to write.

- **Station 2: What is sand made of?**
Materials:
- Book: *Sand* by Margaret Clyne and Rachel Griffiths
- Worksheet
- Instruction card

This center is geared toward students finding out how sand is made. They will read the informational book and draw a picture of how sand is made.

- **Station 3: Sand investigation!**

Materials:
- 2 microscopes
- Petri dishes
- sand
- soil mixture made for the terrarium
- Worksheet
- instruction card

This center, students are going to take a close look at the elements within sand. Answer questions on their worksheet as follows:
- Do you see any small versions of sedimentary rock in there?
- What mineral do you see in the soil?
- When you look really close, does it make sense that sand is just small pieces of rock?
- Explain what you see in Sand.
- Explain what you see in the soil.

**Conclusion:** When students are done, have them staple their worksheet into their journals. Go over the worksheet with the students to make sure that they got the basic ideas. Talk about how the soil used has more living elements than soil found in Utah. Ask the students if they thought that the soil was a big factor in the survival of the plants? What part of the plant is in the soil? What do the roots do in the soil? Do you know any plants that don’t have roots? Summary: Plants need nonliving things, such as soil to survive. The soils you find in deserts are mostly made up of sedimentary rock, sand, and minerals. Have students write what they learned about living and nonliving things within an ecosystem.

**Adaptations and Modifications for Special Learning Needs:**
- Have information cards translated into different language for ELL Students
- Students that have a hard time reading can be paired up with a strong reader.
- Students that have a hard time managing their own activity can have the option of completing one center that is of great interest.
- Have a video on how sand is made.

**Assessment:**
- Students are able to follow directions on information cards. This shows by completing each section of the “Sand Centers” worksheet.
• Students will write short 2-3 sentences of how we need both living and nonliving things within an ecosystem, and how they rely on each other.
• Students will answer the question: How do animals use nonliving things in an ecosystem?

Resources:

http://geology.utah.gov/online/pdf/pi-77.pdf
Rainbow of Rocks is a great source to learn about rocks prominent in the Great Basin area.

http://geology.utah.gov/surveynotes/gladasked/gladrocks.htm
Need a simple explanation and great links on metamorphic, sedimentary, and igneous rocks. Here you go.

Illustration adapted from Montgomery (1990) and Monroe and Wisander (1994)

http://www.rocksandminerals.com/images/rockcycl
Extension Ideas!

• **Plants without soil?** Students will see that some plants will survive with little-no water. Some may pose the question: Can a plant survive with little-no soil? This experiment goes through the process of finding out if this phenomenon is true. Planting a seed with no soil!
  

• **Diorama:** We wanted to extend our unit into having the students do a final project of making a diorama. Criteria would be that students have to have a plant, animal, bug, and nonliving things within the one mini-ecosystem.
  

• **Measuring speed:** Since wind and rain produce sand. Is there more wind in Utah? Have students make their own measuring tool and document the speed of the wind over a period of a week. Get on the internet and compare wind/ratio speeds in different regions of the country.
  

• **Fieldtrip:** We covered only the sedimentary rocks in this unit. This site allows you to go and visit buildings made out of this rock!
  
  [http://geology.utah.gov/surveynotes/gladasked/gladrocks.htm](http://geology.utah.gov/surveynotes/gladasked/gladrocks.htm)