An online exploration of the biotic communities of Arizona with an emphasis on Mathematics and Technology

Exploring Biomes

Lesson 2: Biome Research

LESSON OVERVIEW

In this lesson, a short PowerPoint presentation introduces students to the biomes that scientists have defined. Then, groups of students use online resources to obtain information about one of the world's biomes and present the information to the class. Finally, the students take a test that they have developed.

SUGGESTED GRADE LEVELS

- 6 – 10

ENDURING UNDERSTANDINGS

- A number of characteristics, including elevation, latitude, and climate, are used to divide the world into biomes.
- Scientists have defined numerous biome classifications, but certain biomes, including rainforest, desert, and tundra, are commonly accepted.

OBJECTIVES

Students will:

- Work in groups to achieve an assigned task.
- Use online resources to find relevant information.
- Present information gathered during research.
- Identify the similarities and differences among world biomes.

ARIZONA DEPARTMENT OF EDUCATION STANDARDS

Grade	Science	Mathematics	Technology
6	S1-C3-03; S1-C3-04; S1-C4-01; S1-C4-03; S4-C3-01	S2-C1-02; S2-C1-03; S2-C1-07	1T-E2-02; 2T-E2-01; 2T-E2-02; 5T-E2-02; 5T-E2-03
7	S1-C4-01; S1-C4-03; S4-C3-01; S4-C3-06	S2-C1-03; S2-C1-04; S2-C1-08	
8	S1-C4-02; S1-C4-03; S4-C4-01	S2-C1-03; S2-C1-08	
High School	S1-C4-02; S1-C4-03; S4-C3-01; S4-C3-02; S4-C5-04; S6-C2-15	S2-C1-02; S2-C1-09	5T-P1-03; 5T-P1-04; 5T-P3-01

Note: The full text of these standards can be found in Appendix A.

TIME FRAME

- 3 – 5 days (45 minutes each day)

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MATERIALS

- Computer
- Multi-media projector
- Internet access
- *Biomes of the World* PowerPoint
- *Biome Research Guide* (one per group)
- Poster board, butcher paper, transparencies, or other presentation tools
- Markers
- *Oral Presentation Rubric* (one per group)

TEACHER PREPARATION

- Review the *Biomes of the World* PowerPoint and notes.
- Review the Web sites provided for grade level and content appropriateness.
- Divide the class into eight groups.
- Assign each group to one of the biomes mentioned in the PowerPoint.

SUGGESTED PROCEDURES

1. If Lesson 1 – Mapping Biomes was completed, discuss the results. How did you divide up the world? What difficulties did you have? How many biomes did you come up with? If Lesson 1 was not done, ask students to compare Arizona to Alaska. How are they similar? How are they different? Why are they different?
2. Introduce the purpose of today's lesson. Students will be looking at some biome classifications that many scientists use. Point out (as they may have discovered in Lesson 1) that there may be more than one way to divide the Earth, but there are some standard biomes that most people agree on.
3. Inform students that they will be viewing a short PowerPoint presentation. During the presentation, they should take some notes because they will be assigned to one of the biomes mentioned and will be require to research it in more detail.
4. Present the *Biomes of the World* PowerPoint. You may use the notes provided as discussion points.
5. Divide students into teams with approximately four members. Assign each team to research one of the biomes mentioned in the presentation.
6. Give a *Biome Research Guide* and *Oral Presentation Rubric* to each team and discuss the requirements. Inform teams that they will be using the Internet sites listed on the paper (if permitted, they can also search for additional sites). When they have enough information, they will develop a presentation to teach the class about their particular biome. In addition, they must write three questions about their biome that will be used for a test. They need to make sure that they provide the answers to the questions within their presentation.
7. Give the students a few days to put their biome presentations together.
8. Allow at least two days for presentations to take place.
9. Put together a test using the student-generated questions.

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ASSESSMENT

- Oral presentations using the rubric provided
- Student-generated test

EXTENSIONS

- Students can use their knowledge of biomes to analyze climate data from various cities and attempt to identify which biome it is in (see Appendix B)

Appendix A: Arizona Department of Education Standards – Full Text

Science Standards

Grade	Strand	Concept	Performance Objective
6	1	3 – Analysis and Conclusions	3 – Evaluate observations and data reported by others 4 – Interpret simple tables and graphs produced by others
		4 – Communication	1 – Choose an appropriate graphic representation for collected data: • line graph • double bar graph • stem and leaf plot • histogram 3 – Communicate the results of an investigation with appropriate use of qualitative and quantitative information
	4	3 – Populations of Organisms in an Ecosystem	1 – Explain that sunlight is the major source of energy for most ecosystems
7	1	4 – Communication	1 – Choose an appropriate graphic representation for collected data: • line graph • double bar graph • stem and leaf plot • histogram 3 – Communicate the results of an investigation with appropriate use of qualitative and quantitative information
	4	3 – Population of Organisms in an Ecosystem	1 – Compare food chains in a specified ecosystem and their corresponding food web 6 – Create a model of the interactions of living organisms within an ecosystem
8	1	4 – Communication	2 – Choose an appropriate graphic representation for collected data: • line graph • double bar graph • stem and leaf plot • histogram 3 – Present analyses and conclusions in clear, concise formats
	4	4 – Diversity, Adaptation, and Behavior	1 – Explain how an organism's behavior allows it to survive in an environment

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Science Standards Continued

Grade	Strand	Concept	Performance Objective
High School	1	4 – Communication	2 – Produce graphs that communicate data 3 – Communicate results clearly and logically
	4	3 – Interdependence of Organisms	1 – Identify the relationships among organisms within populations, communities, ecosystems, and biomes 2 – Describe how organisms are influenced by a particular combination of biotic (living) and abiotic (nonliving) factors in an environment
		5 – Matter, Energy, and Organization in Living Systems (Including Human Systems)	4 – Diagram the energy flow in an ecosystem through a food chain
	6	2 – Energy in the Earth System (Both Internal and External)	15 – List the factors that determine climate (e.g., altitude, latitude, water bodies, precipitation, prevailing winds, topography)

Mathematics Standards

Grade	Strand	Concept	Performance Objective
6	2	1 – Data Analysis (Statistics)	2 – Construct a histogram, line graph, scatter plot, or stem-and-leaf plot with appropriate labels and title from organized data 3 – Interpret simple displays of data including double bar graphs, tally charts, frequency tables, circle graphs, and line graphs 7 – Compare trends in data related to the same investigation
7	2	1 – Data Analysis (Statistics)	3 – Determine when it is appropriate to use histograms, line graphs, double bar graphs, and stem-and-leaf plots 4 – Interpret data displays including histograms, stem-and-leaf plots, circle graphs, and double bar graphs 8 – Compare trends in data related to the same investigation
8	2	1 – Data Analysis (Statistics)	3 – Determine the appropriate type of graphical display for a given data set 8 – Compare trends in data related to the same investigation

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Mathematics Standards Continued

Grade	Strand	Concept	Performance Objective
High School	2	1 – Data Analysis (Statistics)	2 – Organize collected data into an appropriate graphical representation 9 – Draw inferences from charts, tables, graphs, plots, or data sets

Technology Standards

Grade	Strand	Concept	Performance Objective
6, 7, 8	1	2 – Demonstrate increasingly sophisticated operation of technology components	2 – Retrieve and save information remotely (e.g., network servers, Internet, Intranet, peripheral devices)
	2	2 – Exhibit legal and ethical behaviors when using technology and information and discuss consequences of misuse	1 – Follow rules for deciding when permission is needed for using the work of others, (e.g., some sites specify whether permission is required or not, some work is in public domain) 2 – Obtain permission to use the work of others
	5	2 – Evaluate the accuracy, relevance, appropriateness, comprehensiveness and bias of electronic information sources	2 – Gather research from a variety of electronic sources and identify the most appropriate information for answering the research question 3 – Obtain permission, when appropriate, to use the work of others
High School	5	1 – Develop a research strategy to find accurate, relevant, appropriate electronic information sources	3 – Independently select appropriate electronic resources from school, community and the world (via online) to be used to locate information needed when presented with a problem to solve 4 – Evaluate the appropriateness and effectiveness of electronic resources (e.g., purpose, credibility of author)
		3 – Present research findings from electronic resources using academic models for citations and formats	1 – Utilize evaluation criteria (authority, accuracy, relevancy, timeliness) for information found on the Internet to present research findings

Appendix B: Making Climographs

1. Explain to students that a climograph summarizes a location's climate in one simple graph. The graph contains both the average temperature and the rainfall for that location during each month of the year.
2. To be consistent, all climographs should follow the same format. The months should always be located on the bottom of the graph. Precipitation or rainfall should be on the left vertical axis and is represented with a bar graph. The average temperature should be on the right vertical axis and is represented with a line graph. Of course, there should always be a legend explaining the graph. See Graph 1 for a climograph for Flagstaff.
3. In the tables below, there is climate data for five United States cities. Have the students practice making climographs using this data. *Note: temperatures are listed in degrees Fahrenheit.*
4. When they are familiar with the climographs for various biomes, students should try to identify in which biome each of these cities can be found.

Graph 1 Climograph for Flagstaff, AZ

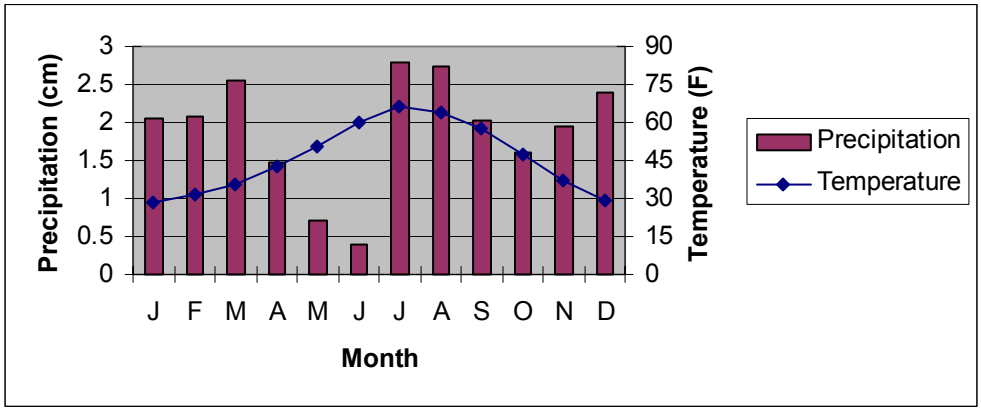

Table 1: Climate Data for Yuma, AZ

Temperature (F)	56.5	60.7	64.9	71.4	79.0	87.6	93.7	92.7	86.8	76.2	64.2	56.4
Precipitation (cm)	0.35	0.22	0.21	0.14	0.04	0.02	0.26	0.64	0.31	0.29	0.24	0.45

Table 2: Climate Data for Cold Bay, AK

Temperature (F)	28.6	27.4	29.9	33.3	39.6	45.7	50.5	51.5	47.7	39.6	34.4	31.0
Precipitation (cm)	2.84	2.27	2.16	1.97	2.29	2.10	2.52	3.24	4.41	4.34	4.19	3.67

Table 3: Climate Data for Lihue, HI

Temperature (F)	71.6	71.6	72.7	74.0	75.8	77.8	78.9	79.5	79.2	77.6	75.5	72.9
Precipitation (cm)	5.89	3.33	4.17	3.50	3.15	1.69	2.13	1.76	2.37	4.41	5.45	5.15

Table 4: Climate Data for Wichita, KS

Temperature (F)	29.5	34.8	45.4	56.4	65.6	75.7	81.4	79.3	70.3	58.6	44.7	33.0
Precipitation (cm)	0.79	0.96	2.43	2.38	3.81	4.31	3.13	3.02	3.49	2.22	1.59	1.20

Table 5: Climate Data for Olympia, WA

Temperature (F)	38.0	41.1	43.8	47.5	53.2	58.7	62.9	63.3	57.9	49.7	42.5	38.2
Precipitation (cm)	8.01	5.77	4.95	3.29	2.09	1.63	0.82	1.29	2.26	4.31	8.05	8.12

Data provided by http://www.mobot.org/education/02programsresources/mappingenvironment/mynaturalcommunity/front.htm

Appendix C: Worksheets and Overheads

The pages that follow contain the worksheets listed below:

A. *Biomes of the World* PowerPoint – Use these notes to assist you in your presentation (14 pages)

B. *Biome Research Guide* – A worksheet that provides all of the requirements for the group research project (1 page)

C. *Oral Presentation Rubric* – One method for grading the group presentations (1 page)