Exploring Animal Environments

Background: In our studies of science, we have been investigating various water and dry-land environments to help us understand how these environments can support a diversity of plants and animals while sharing limited resources. You will use your research to complete the challenge below.

Design Challenge: Design and build a model of a mammal, reptile, bird, amphibian, fish, or insect that lives in an environment that you researched. Work with classmates who have researched the same environment. Make sure that others can identify the animal by looking at it and that a part of it can move without your hands touching the animal. You must provide a scenic background for your animal that represents the environment in which it lives.

Criteria: All of your work must be neatly constructed.	
Your animal model must ☐ be identifiable by looking at it ☐ be the appropriate size for the background ☐ have at least one part that can move five consecutive times without you touching the animal's body.	Your background must ☐ be no smaller than 12" x 24" and no larger than 24" x 36" when flat ☐ stand by itself behind your animal.

Materials: Select from the list below.				**Tools:** Select from the list below.
• balloons • cardboard • cardboard tubes • construction paper • craft sticks	• egg cartons • glue • magnets • newspaper • paper clips	• paper fasteners • pipe cleaners • plastic tubing • poster board • scrap paper	• straws • string or yarn (limit 1 yard) • Styrofoam • syringes	• pencil • pushpin paper drill • scissors

Targeted Standard of Learning: Science 3.6

Supporting SOL: English 3.1, 3.2, 3.4, 3.6, 3.7; Mathematics 3.9; Science 3.1, 3.2, 3.4, 3.10

Targeted Standard for Technological Literacy: 9

Supporting STL: 8, 10, 11

Tips for Teachers

Targeted Standard of Learning:

Science 3.6 The student will investigate and understand that ecosystems support a diversity of plants and animals that share limited resources. Key concepts include

a) aquatic ecosystems;
b) terrestrial ecosystems;
c) populations and communities; and
d) the human role in conserving limited resources.

Supporting SOL: English 3.1, 3.2, 3.4, 3.6, 3.7; Mathematics 3.9; Science 3.1, 3.2, 3.4, 3.10

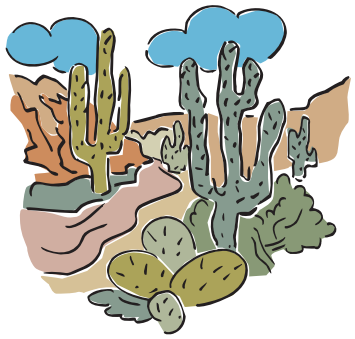
Targeted Standard for Technological Literacy:

9 Students will develop an understanding of engineering design.

Supporting STL: 8, 10, 11

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Design Process
• Exposure to targeted Science Standard of Learning 3.6 • Completed KWL research • Exposure to the design process • Exposure to simple mechanisms • Exposure to pneumatic systems (optional)	• Check Design Brief for recommended materials. Teacher may substitute materials.	• Discuss proper use of tools. • Supervise cutting of Styrofoam. • Students should only use syringes provided by the teacher.	• Small groups • Consider using one Guided Portfolio per group.	• Design Brief • Guided Portfolio (adapt as appropriate/ optional) • KWL chart • Rubric Assessments	Follow the Design Process: • Restate the problem. • Brainstorm solutions. • Create the best solution. • Test the solution. • Evaluate the solution.

Guided Portfolio



Name _____

Group Members _____

1. What is the problem? State the problem in your own words.

Guided Portfolio, p2

Name _____

2. Brainstorm solutions. Sketch and/or describe some possible solutions.

Name _____

3. Create the solution you think is best.

Keep notes about your problems and how you solve them. Make sketches if they help.

Name _____

4. Test your solution.

Is your animal identifiable by looking at the model? YES NO

Is your animal model the appropriate size for the background? YES NO

Does your animal model have at least one part that can move five consecutive times without your hands touching the animal? YES NO

- Identify the part, and explain how it works.

Is the background no smaller than 12" x 24" and no larger than 24" x 36" when flat? YES NO

- What is the length of your background? _____
- What is the width of your background? _____

Can the background stand by itself behind your animal? YES NO

- Explain how you made it stand.

Name _____

5. Evaluate your solution.

Was it the best solution? Why, or why not?

_____

_____

_____

Look back at your brainstorming page. Would one of your other ideas have been better? Explain your reasoning.

_____

_____

_____

What did you learn by designing and creating this model?

_____

_____

Name _____

KWL: Exploring Animal Environments

Note: The teacher should make sure that all required information is listed in question form on the "W" (what we want to know) section of the KWL.

What we **K**now	What we **W**ant to know	What we **L**earned
	Sample Questions: Where can this environment be found? What kinds of animals live there? What kinds of plants grow there? What is the climate?	

Rubric for Exploring Animal Environments

Name_____ Date _____

0—no evidence; 1—limited understanding; 2—some understanding with room for improvement; 3—good understanding with room for improvement; 4—substantial understanding

Design Brief Rubric	**0**	**1**	**2**	**3**	**4**
The student restated the problem in his/her own words.					
The student brainstormed more than one idea.					
The student shared problems that occurred and their solutions through written notes or oral communication per teacher's instructions.					
The student tested the animal model to make sure that					
• it is identifiable.					
• it is an appropriate size for the background.					
• it has at least one part that can move five consecutive times without a person touching the animal's body.					
The student evaluated how he/she could make it better next time.					

Rubric for Exploring Animal Environments

Name_____ Date _____

0—no evidence; 1—limited understanding; 2—some understanding with room for improvement; 3—good understanding with room for improvement; 4—substantial understanding

Oral Communication Rubric	**0**	**1**	**2**	**3**	**4**
3.1 The student will use effective communication skills in group activities.					
a) Listen attentively by making eye contact, facing the speaker, asking questions, and summarizing what is said.					
b) Ask and respond to questions from teachers and other group members.					
c) Explain what has been learned.					
d) Use language appropriate for context.					
e) Increase listening and speaking vocabularies.					
3.2 The student will present brief oral reports using visual media.					
a) Speak clearly.					
b) Use appropriate volume and pitch.					
c) Speak at an understandable rate.					
d) Organize ideas sequentially or around major points of information.					
e) Use contextually appropriate language and specific vocabulary to communicate ideas.					

Standards of Learning

English (2010)

Oral Language

3.1 The student will use effective communication skills in group activities.

a) Listen attentively by making eye contact, facing the speaker, asking questions, and summarizing what is said.
b) Ask and respond to questions from teachers and other group members.
c) Explain what has been learned.
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3.2 The student will present brief oral reports using visual media.

a) Speak clearly.
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e) Use contextually appropriate language and specific vocabulary to communicate ideas.

Reading

3.4 The student will expand vocabulary when reading.

a) Use knowledge of homophones.
b) Use knowledge of roots, affixes, synonyms, and antonyms.
c) Apply meaning clues, language structure, and phonetic strategies.
d) Use context to clarify meaning of unfamiliar words.
e) Discuss meanings of words and develop vocabulary by listening and reading a variety of texts.
f) Use vocabulary from other content areas.
g) Use word reference resources including the glossary, dictionary, and thesaurus.

3.6 The student will continue to read and demonstrate comprehension of nonfiction texts.

a) Identify the author's purpose.
b) Use prior and background knowledge as context for new learning.
c) Preview and use text features.
d) Ask and answer questions about what is read.
e) Draw conclusions based on text.
f) Summarize major points found in nonfiction texts.

g) Identify the main idea.
h) Identify supporting details.
i) Compare and contrast the characteristics of biographies and autobiographies.
j) Use reading strategies to monitor comprehension throughout the reading process.
k) Identify new information gained from reading.
l) Read with fluency and accuracy.

3.7 The student will demonstrate comprehension of information from a variety of print and electronic resources.
a) Use encyclopedias and other reference books, including online reference materials.
b) Use table of contents, indices, and charts.

Mathematics (2009)

Measurement

3.9 The student will estimate and use U.S. Customary and metric units to measure

a) length to the nearest $\frac{1}{2}$-inch, inch, foot, yard, centimeter, and meter;
b) liquid volume in cups, pints, quarts, gallons, and liters;
c) weight/mass in ounces, pounds, grams, and kilograms; and
d) area and perimeter.

Science (2010)

Scientific Investigation, Reasoning, and Logic

3.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
a) observations are made and are repeated to ensure accuracy;
b) predictions are formulated using a variety of sources of information;
c) objects with similar characteristics or properties are classified into at least two sets and two subsets;
d) natural events are sequenced chronologically;
e) length, volume, mass, and temperature are estimated and measured in metric and standard English units using proper tools and techniques;
f) time is measured to the nearest minute using proper tools and techniques;
g) questions are developed to formulate hypotheses;
h) data are gathered, charted, graphed, and analyzed;
i) unexpected or unusual quantitative data are recognized;
j) inferences are made and conclusions are drawn;

k) data are communicated;
l) models are designed and built; and
m) current applications are used to reinforce science concepts.

Force, Motion, and Energy

3.2 The student will investigate and understand simple machines and their uses. Key concepts include
a) purpose and function of simple machines;
b) types of simple machines;
c) compound machines; and
d) examples of simple and compound machines found in the school, home, and work environments.

Matter

3.3 The student will investigate and understand that objects are made of materials that can be described by their physical properties. Key concepts include
a) objects are made of one or more materials;
b) physical properties remain the same as the material is changed in visible size; and
c) visible physical changes are identified.

Life Processes

3.4 The student will investigate and understand that adaptations allow animals to satisfy life needs and respond to the environment. Key concepts include
a) behavioral adaptations; and
b) physical adaptations.

Living Systems

3.6 The student will investigate and understand that ecosystems support a diversity of plants and animals that share limited resources. Key concepts include
a) aquatic ecosystems;
b) terrestrial ecosystems;
c) populations and communities; and
d) the human role in conserving limited resources.

Earth Resources

3.10 The student will investigate and understand that natural events and human influences can affect the survival of species. Key concepts include
a) the interdependency of plants and animals;
b) the effects of human activity on the quality of air, water, and habitat;

c) the effects of fire, flood, disease, and erosion on organisms; and
d) conservation and resource renewal.

Standards for Technological Literacy

Standard 8: Students will develop an understanding of the attributes of design.

Standard 9: Students will develop an understanding of engineering design.

Standard 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Standard 11: Students will develop the abilities to apply the design process.

Please give us some feedback.

Complete the form below to let us know how this design brief worked for you and your students. Please be specific so that we might use your suggestions to improve the activity. *You can fill this out on your computer, or you can print it, fill it out manually, and scan it.*

Teacher: _____

School: _____

School division: _____

Design brief title: _____

Background *Put an X in the appropriate column:*	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does it set the context for the activity?			
Is it age-appropriate in language, length, and complexity?			
Does it reference prior learning and/or research that the students did that will facilitate designing a solution to a problem?			
Is it detailed enough that an adult will understand the purpose for the design brief?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Design Challenge	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does the challenge support your curriculum?			
Is it age-appropriate in language, length, and complexity?			
Is it detailed enough that an adult will understand the purpose for the design brief?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Criteria Criteria are part of the challenge. They set the limitations for the design. They are not directions.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Are the limitations age-appropriate?				
Do the limitations encourage critical thinking?				
Is the application of mathematic knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of science knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of social studies knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Are language skills integrated into the criteria? If not, should the skill area be addressed?				
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

Materials Materials help set the limitations for the design. The list should include materials that might work.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Does the materials list encourage a variety of design solutions?				
Does the materials list include a variety of choices for joining items?				
Does the materials list include materials that force students to make decisions?				
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

Tools Tools can be used in the construction of the designed product. They are used to manipulate materials. They cannot become part of the product.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the tools listed age appropriate?			
Are all tools needed for the activity included?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Standards of Learning	Yes	No
Does the design brief reinforce the targeted Standard of Learning(s)?		
Are the supporting Standards of Learning appropriate?		
What Standards of Learning would you add or remove?		

Standards for Technological Literacy	Yes	No
Does the design brief reinforce the targeted Standard(s) for Technological Literacy?		
Are the supporting Standards for Technological Literacy appropriate?		
What Standards for Technological Literacy would you add or remove?		

Tips for Teachers	Yes	No
Are the tips listed in the chart helpful for a first-time teacher?		
What tips would you add?		

Guided Portfolio	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the instructions and questions age appropriate and clear?			
In the "Test your solution" section, do the questions force students to thoroughly test their solutions?			
In the "Evaluate your solution" section, do the questions force students to honestly evaluate their solutions			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Additional Comments Please use this area to provide general suggestions for improving this design brief.