How Does Your Garden Grow?

Background: Change happens to all plants as they grow. They can get larger and change shape. A mature plant looks different than it did when it first begins growing.

Design Challenge: Design and create a pop-up that shows at least two stages of a plant as it grows. Show how it changes over time.

Criteria: Your project must

- ☐ show how your plant changed over time
- ☐ have at least one pop-up mechanism
- ☐ contain a triangle and a circle.

Materials: Select from the items listed below.		**Tools:** Select from the items listed below.
• cardstock • construction paper • glue • paper fasteners • paper scraps	• pipe cleaners • Popsicle sticks • straws • yarn	• markers/crayons • scissors

Targeted Standard of Learning: Science K.7

Supporting SOL: English K.1, K.2, K.3; Mathematics K.11

Targeted Standard for Technological Literacy: 9

Supporting STL: 8

Tips for Teachers

Targeted Standard of Learning:

Science K.7 The student will investigate and understand basic needs and life processes of plants and animals. Key concepts include

c) plants and animals change as they grow, have varied life cycles, and eventually die; and
d) offspring of plants and animals are similar but not identical to their parents or to one another.

Supporting SOL: Mathematics K.11; English K.1, K.2, K.3

Targeted Standard for Technological Literacy:

9 Students will develop an understanding of engineering design.

Supporting STL: 8

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Design Process
• How to make at least two types of pop-ups • Plant life cycle • Chart with different plants growing	• Check Design Brief for recommended materials. Teacher may substitute materials.	• Use of scissors	• Partners or small groups	• Design Brief • Guided Portfolio (optional) • Rubric Assessment	Follow the Design Process: • Restate the problem. • Brainstorm solutions. • Create the best solution. • Test the solution. • Evaluate the solution.

Extension Ideas: Have students read Lois Ehlert's *Planting a Rainbow* or Sam Godwin's *A Seed in Need*.

Guided Portfolio

Name _____

Group Members _____

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

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.

How does your plant change? _____

_____

How does your pop-up work? _____

_____

Does your project have a triangle? YES NO

Does your project have a circle? YES NO

Name _____

5. Evaluate your solution.

Was it the best solution? Why or why not?

_____

_____

_____

What would you have done differently?

_____

_____

_____

Rubric for How Does Your Garden Grow? 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

Student Evaluation	**0**	**1**	**2**	**3**	**4**
Oral Presentation: The student					
• used complete sentences					
• used descriptive words.					
Guided Portfolio: The student participated in					
• restating the problem					
• brainstorming solutions					
• creating a solution					
• testing the solution					
• evaluating the solution.					
Team Skills: The student					
• used appropriate voice					
• encouraged team members					
• listened to team members					
• was involved in all aspects of the project					
• respected team members.					

Tested Criteria	YES	NO
The plant shows a physical change.		
The project has a pop-up mechanism.		
The project has a circle and a triangle.		

Standards of Learning

English (2010)

Oral Language

K.1 The student will demonstrate growth in the use of oral language.

a) Listen to a variety of literary forms, including stories and poems.
b) Participate in a variety of oral language activities including choral and echo speaking and recitation of short poems, rhymes, songs, and stories with repeated word order patterns.
c) Participate in oral generation of language experience narratives.
d) Participate in creative dramatics.
e) Use complete sentences that include subject, verb, and object.

K.2 The student will expand understanding and use of word meanings.

a) Increase listening and speaking vocabularies.
b) Use number words.
c) Use words to describe/name people, places, and things.
d) Use words to describe/name location, size, color, and shape.
e) Use words to describe/name actions.
f) Ask about words not understood.
g) Use vocabulary from other content areas.

K.3 The student will build oral communication skills.

a) Express ideas in complete sentences and express needs through direct requests.
b) Begin to initiate conversations.
c) Begin to follow implicit rules for conversation, including taking turns and staying on topic.
d) Listen and speak in informal conversations with peers and adults.
e) Participate in group and partner discussions about various texts and topics.
f) Begin to use voice level, phrasing, and intonation appropriate for various language situations.
g) Follow one- and two-step directions.
h) Begin to ask how and why questions.

Mathematics (2009)

Focus: Plane Figures

K.11 The student will

a) identify, describe, and trace plane geometric figures (circle, triangle, square, and rectangle); and
b) compare the size (larger, smaller) and shape of plane geometric figures (circle, triangle, square, and rectangle).

Science (2010)

Life Processes

K.7 The student will investigate and understand basic needs and life processes of plants and animals. Key concepts include

a) animals need adequate food, water, shelter, air, and space to survive;
b) plants need nutrients, water, air, light, and a place to grow to survive;
c) plants and animals change as they grow, have varied life cycles, and eventually die; and
d) offspring of plants and animals are similar but not identical to their parents or to one another.

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.

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.