



ADDING STEM TO LITERACY

Using Tuft University's Novel Engineering Process

<p>Introduction</p>	<p>Novel Engineering is a design engineering process created around literacy with plots and characters that are interesting along with setting descriptions that are detailed. While reading a book to or with students, the teacher will help students identify the problems encountered by the characters. Students will develop solutions and design a functional solution to help the characters. -Adapted from Tufts University Center for Engineering and Outreach</p>										
<p>Book Summary</p>	<div style="display: flex; align-items: flex-start;">  <div style="margin-left: 20px;"> <p>Muncha! Muncha! Muncha! by Candace Fleming</p> <p>After planting his dream garden, the main character, Mr. McGreely, tries to find a way to keep rabbits from going into it and eating all of his vegetables.</p> </div> </div>										
<p>Curriculum Connections</p>	<p>Math: Diagrams/Measurement/Geometry</p> <p>Science: Living/Non-Living Organisms Characteristics and Needs of Plants and Animals Effects of Plants and Animals on the Environment</p> <p>ELA: Inference Prediction Problem and Solution Cause and Effect</p>										
<p>Digital Resources</p>	<p>Discovery Education -- The Magic School Bus Goes To Seed , STEM Careers , 7 Steps To Planting A Garden</p> <p>Britannica Animal Kingdom — “Rabbits and Hares”</p> <p>A to Z Animals-Alligators — https://a-z-animals.com/animals/rabbit/</p> <p>National Geographic Kids-Plant a Garden — https://kids.nationalgeographic.com/explore/nature/plant-a-garden/</p> <p>The Old Farmer’s Almanac: How to Get Rid of Rabbits — https://www.almanac.com/pest/rabbits</p>										
<p>Print Resources</p>	<p>Encyclopedias</p> <p>Nonfiction materials about rabbits and gardens.</p>										
<p>Makerspace Ideas</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 5px;">Tool</th> <th style="text-align: left; padding: 5px;">Application in Project</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Makey Makey</td> <td style="padding: 5px;">Create automated component to design solution.</td> </tr> <tr> <td style="padding: 5px;">Ozobot</td> <td style="padding: 5px;">Create a map of the garden and use the Ozobot as the “rabbit” Develop a plan to lead the rabbit around the vegetables and out of the garden</td> </tr> <tr> <td style="padding: 5px;">KEVA Planks, LEGOS, Makedo Kits</td> <td style="padding: 5px;">Use as building supplies to create design solutions to build something to keep the rabblits out of the garden.</td> </tr> <tr> <td style="padding: 5px;">Cubetto</td> <td style="padding: 5px;">Create a map of the garden and use the Cubetto as the “rabbit” Develop a plan to lead the rabbit around the vegetables and out of the garden</td> </tr> </tbody> </table>	Tool	Application in Project	Makey Makey	Create automated component to design solution.	Ozobot	Create a map of the garden and use the Ozobot as the “rabbit” Develop a plan to lead the rabbit around the vegetables and out of the garden	KEVA Planks, LEGOS, Makedo Kits	Use as building supplies to create design solutions to build something to keep the rabblits out of the garden.	Cubetto	Create a map of the garden and use the Cubetto as the “rabbit” Develop a plan to lead the rabbit around the vegetables and out of the garden
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Part One: Reading

<p>Overview</p>	<p>In Session One, the teacher and students read the text and begin to identify possible problems to solve. Novel Engineering is a design engineering process created around literacy with plots and characters that are interesting along with setting descriptions that are detailed</p> <p style="text-align: right;"><i>-Adapted from Tufts University Center for Engineering and Outreach</i></p>
<p>Icebreaker</p>	<p>Show Discovery Education video -- "7 Steps To Planting A Garden" Length: 8m 36s</p> <p>This video shows the process of creating a plan for a garden and caring for the plants that are part of that garden in order to watch them grow.</p>
<p>Implementation Strategies</p>	<p><u>Reading of Text</u></p> <ul style="list-style-type: none"> • Whole Group Read by Teacher • Individual Silent Read • Partner Read <p><u>Identification of Possible Problems</u></p> <ul style="list-style-type: none"> • Whole Group Recorded on Board or Chart Paper • Individual Recorded on Paper/Shared with Group • Think-Pair-Share...Then Shared with Group
<p>Possible Problems</p>	<p>Rabbits get into garden and eat vegetables.</p> <p>Mr. McGreely's solutions don't work.</p> <p>Mr. McGreely builds a wall so big it is hard for him to get into and out of the garden.</p> <p>Rabbits sneak into the basket.</p>
<p>Questions/Prompts</p>	<ul style="list-style-type: none"> • What is a problem? • What is a solution? • What problems occur when Mr. McGreely makes his garden? • Why do you think the "small wire fence" did not work? • Why do you think the "tall wooden wall" did not work? • Why do you think the "deep wet trench" did not work? • What worked with the "huge enormous thing"? • What didn't work with the "huge enormous thing"?
<p>Vocabulary Words</p>	<p style="text-align: center;">garden hungry gnawed sprouts stem twitch nibble trench enormous</p>
<p>Materials</p>	<p>Chart Paper/Markers (Whole Group Discussion)</p> <p>Paper/Pencils or Small Dry Erase Boards/Markers (Individual or Think-Pair-Share)</p>



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Part Two: Solutions

<p>Overview</p>	<p>In Part Two, the students revisit the problems they identified and discuss which ones they can solve using engineering. The teacher reviews criteria and expectations for the solutions, including time period and available materials. Students brainstorm solutions.</p> <p style="text-align: right;"><i>-Adapted from Tufts University Center for Engineering and Outreach</i></p>
<p>Research</p>	<p>Using the provided "Rabbit Research Worksheet", have students research rabbits online using Britannica Animal Kingdom — "Rabbits and Hares"</p> <p>This can be done as a whole class activity, groups or individually based on your students.</p>
<p>Implementation Strategies</p>	<p>Identification of Possible Solutions</p> <ul style="list-style-type: none"> • Whole Group Recorded on Board or Chart Paper • Individual Recorded on Paper/Shared with Group • Think-Pair-Share...Then Shared with Group
<p>Possible Solutions</p>	<ul style="list-style-type: none"> • Build a Better Fence/Wall • Build a Trap • Build a Greenhouse Over the Garden • Build a Separate Garden Just for the Rabbits • Domesticate the Rabbits and Keep as Pets • Put Food Out for Rabbits <p>(If your students need help , read and discuss The Old Farmer's Almanac: How to Get Rid of Rabbits — https://www.almanac.com/pest/rabbits)</p>
<p>Questions / Prompts</p> <p>Use to Guide Your Students through Brainstorming</p>	<p>What can Mr. McGreely do to keep rabbits out of the garden?</p> <p>As students propose solutions, ask them:</p> <ul style="list-style-type: none"> • How would the solution work? • What benefits are there to Mr. McGreely? To the rabbits? • What potential problems are there? • What is an Engineer? (Clarify it is someone who designs/builds a solution) <p>Which of our proposed solutions are engineering solutions?</p>
<p>Materials</p>	<p>Chart Paper/Markers (Whole Group Discussion)</p> <p>Paper/Pencils or Small Dry Erase Boards/Markers (Individual or Think-Pair-Share)</p>



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Part Three - Design/Build/Test/Share

<p>Overview</p>	<p>In Part Three, the students select a solution that they will design either individually, with a partner, or in a small group. Students will think about and sketch their designs on planning sheets. Students share their proposals with classmates for feedback. Students build and test their designs, making modifications as needed. Students will all share completed projects.</p> <p style="text-align: right;"><i>-Adapted from Tufts University Center for Engineering and Outreach</i></p>
<p>Implementation Strategies</p>	<p>Set up students for Building</p> <ul style="list-style-type: none"> • Individually • Partners • Small Groups or teams
<p>Questions/Prompts</p> <p>Use to Guide Your Students through Building Process</p>	<ul style="list-style-type: none"> • Review with students the supplies available to use for construction, as well as how much time they will have to complete their projects. • Stress the importance of considering what the trap, fence or greenhouse needs to look like, what features they would need to keep the rabbits out still let Mr. McGreely get to his vegetables easily. • Encourage students to give and receive feedback on their designs and their prototypes.
<p>Resources/ Materials</p>	<ul style="list-style-type: none"> • Designs Sheets/Pencils • Building Supply List • Building Supplies
<p>Wrap-Up/ STEM Careers</p>	<p>Discovery Education video-- STEM Careers Length: 3m 50s</p> <p>This video introduces Natasha Nicholes - the blogger and face behind the Union Avenue Community Garden in Chicago, Illinois. The program emphasizes how the garden contributes to the neighborhood community, and teaches some of the ways that students can top their pizza. The program also highlights the significance of planting the food one eats.</p>
<p>Ways to Share ...in the Classroom ... in the School ...in the Community</p>	<ul style="list-style-type: none"> • Displays in Classrooms or School-Wide Area • Presentations • Showcase Event with Parents • Photos/Descriptions on School Web Site • See Saw • Flip Grid



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Media Center Connections

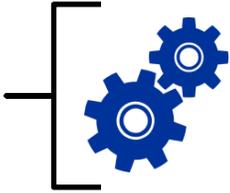
Overview

Novel Engineering projects naturally lend themselves to activities and lessons that can be carried out in the Media center.

Lesson/ Activity

Britannica Animal Kingdom as a Source of Information Use the NE project as an opportunity to show students how to find information on a wide range of animals via Animal Kingdom:

1. Review with students what a database is and how it is different from a Web site and why it is a reliable source of information.
2. Demonstrate how to access Animal Kingdom via MackinVIA and then how to use different strategies (search box/A to Z listing/categories) to look up information on animals.
3. Model how to read the article and how to locate relevant information.
4. Demonstrate how to use additional resources on Animal Kingdom (links to Animal Kingdom articles on similar topics/links to related Web sites/photos and videos). Students practice research skills by searching Animal Kingdom for information on rabbits and using that information in their work on the NE project.



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RABBIT RESEARCH WORKSHEET

What are rabbits? _____

Where in the world can you find rabbits? _____

What do rabbits look like? _____

What do rabbits eat? _____

Where do rabbits live? _____

Do rabbits have any enemies? _____
