

## RAMP UP – LIFTOFF Lesson Plan

<b>Title of Lesson:</b>	Ready, Set, Blast-Off! – Utilizing Straw Rockets to Learn about Engineering Design
<b>Grade Level:</b>	1
<b>AL COS Standard:</b>	N/A
<b>NGSS:</b>	K-2 ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
<b>Learning Targets/Objectives:</b>	<ul style="list-style-type: none"><li>● Students will develop a model to illustrate how the shape of an object helps it function as needed to solve a given problem.</li><li>● Students will develop an effective wing design using straw and index cards to launch and hit a target from different angles and distances.</li></ul>
<b>Materials Needed:</b>	<ul style="list-style-type: none"><li>● <b>Book</b><ul style="list-style-type: none"><li>○ <i>Incredible Inventions</i> by Lee Bennett Hopkins<ul style="list-style-type: none"><li>▪ Link to purchase on Amazon - <a href="https://www.amazon.com/Incredible-Inventions-Lee-Bennett-Hopkins/dp/0060872454">https://www.amazon.com/Incredible-Inventions-Lee-Bennett-Hopkins/dp/0060872454</a></li></ul></li></ul></li><li>● <b>Videos</b><ul style="list-style-type: none"><li>○ The Engineer Song - <a href="https://www.youtube.com/watch?v=Ra7Bax6rGoQ">https://www.youtube.com/watch?v=Ra7Bax6rGoQ</a></li><li>○ Potential and Kinetic Energy - Law of Conservation of Energy – Video for Kids - <a href="https://www.youtube.com/watch?app=desktop&amp;v=t0ShHdtB8jA">https://www.youtube.com/watch?app=desktop&amp;v=t0ShHdtB8jA</a></li></ul></li><li>● <b>Other Materials</b><ul style="list-style-type: none"><li>○ Target - Can print one for free on <a href="http://coloringhome.com">coloringhome.com</a></li><li>○ Classroom items that can be used as a target at different distances</li><li>○ Poster board for students to create their own targets</li><li>○ Pencils, crayons, markers</li><li>○ Scissors</li><li>○ Tape</li></ul></li><li>● <b>RAMP UP LIFTOFF Kit</b></li></ul>

	<ul style="list-style-type: none"> <li>○ All materials needed for the LIFTOFF experiment are included in the kit.</li> </ul> <p>Links to the videos and the book can also be found on the LIFTOFF Kit Resources page <a href="https://uahrapup.org/liftoff/">https://uahrapup.org/liftoff/</a></p>
<b>Preparation:</b>	<ul style="list-style-type: none"> <li>● Educator will select an open space (e.g., hallway, courtyard, gym, etc.) to complete the experiment.</li> <li>● Educators will set up targets at different distances across the space</li> <li>● Educator will have a LiftOff Guide, which includes materials and step by step instructions for how to set up the launcher.</li> <li>● Educators will prepare a target worksheet or poster board for students to create their target.</li> <li>● Educator will prepare the straw rocket launcher.</li> </ul>
<b>Lesson Logistics:</b>	<p>This lesson will take 4 days to incorporate fully with 45 minutes each day.</p> <p>Day 1: Introduction to Engineering</p> <ul style="list-style-type: none"> <li>- whole group instruction</li> <li>- video – <i>The Engineer Song</i></li> <li>- read book</li> <li>- introduce the problem</li> <li>- think, pair, share</li> <li>- K in KWL chart</li> </ul> <p>Day 2: Straw Rocket Launcher Experiment</p> <ul style="list-style-type: none"> <li>- students will be divided into groups of 4</li> <li>- students will perform experiment in the hallway</li> <li>- students will fill out W in KWL chart</li> </ul> <p>Day 3: Explain and Extend portion</p> <ul style="list-style-type: none"> <li>- discuss key concepts and vocabulary</li> <li>- video - <i>Potential and Kinetic Energy - Law of Conservation of Energy – Video for Kids</i></li> <li>- group discussion</li> <li>- brainstorm and develop different fin shapes</li> </ul> <p>Day 4: Informal Evaluation</p> <ul style="list-style-type: none"> <li>- students will fill out L in KWL chart</li> <li>- students will work in groups</li> </ul>

<b>Vocabulary Words:</b>	<ul style="list-style-type: none"> <li>● engineer</li> <li>● angle</li> <li>● force</li> <li>● energy</li> <li>● distance</li> <li>● target</li> <li>● shape</li> </ul>
<b>Safety Considerations:</b>	Seek LiftOff Guide for safety considerations.
<b>Engage:</b>	<p><b>Day 1:</b></p> <p><b>Essential Questions:</b></p> <ul style="list-style-type: none"> <li>- <b>What is Engineering?</b></li> <li>- <b>How can engineering help us solve a problem?</b></li> <li>- <b>How can the shape of an object help it function to solve a problem?</b></li> </ul> <p><b>Step 1:</b> At the beginning of this lesson, the teacher will start the science lesson with whole group instruction by activating prior knowledge. The teacher will ask students, “What do you think Engineering is?” The teacher will call on students to share their answers. The teacher will then explain what an engineer is and give some examples. “An engineer is someone who invents and builds things to help solve a problem.”</p> <p><b>Step 2:</b> The teacher will lead students to the carpet area (or they may stay at their desks) to watch <i>The Engineer Song</i> video. After the song plays, ask students, “What did you notice in the video?” Teacher will call on students for answers.</p> <p>Teacher will ask students, “how do you think engineering helps us solve a problem? Turn to your partner and share your ideas.” Teacher will then call on students for answers. Teacher will introduce the book, <i>Incredible Inventions</i> by Lee Bennett Hopkins and explain that inventions can come from all shapes and sizes and that anyone can be an engineer with a little imagination. During the book, the teacher will frequently pause and check for understanding.</p> <p><b>Step 3:</b> Following the book, the teacher will introduce the experiment for tomorrow. The teacher will say, “Let’s put our engineer caps on. If we were engineers and developed a rocket to launch a straw into the air, how can the shape of our wings</p>

	<p>function to hit a target at different angles?” Students will pair-share their idea.</p> <p><b>Step 4:</b> At the end of the 45 minutes, teacher will create a KWL chart and fill out the “K” at the front of the class. The teacher will ask “What do we know from today’s lesson?” Fill out the “W” at the front of the class. The teacher will ask “What do we want to know from today’s lesson?”</p>
<p><b>Explore:</b></p>	<p><b>Day 2:</b></p> <p><b>Step 1:</b> The teacher will start this lesson by activating prior knowledge and asking students what they remember from yesterday. Teacher will pull up the KWL chart and reference the “K” and “W” chart.</p> <p><b>Step 2:</b> The teacher will introduce the “Straw Rocket Launcher experiment and go over safety precautions (see LiftOff Guide for safety considerations).</p> <p><b>Step 3:</b> The teacher will pass out either poster board or the target worksheet for students to create their own target. Then, the teacher will pass out the Straw Rocket Launcher already assembled to groups of 4 students. The teacher will pass out supplies from the Straw Rocket Launcher kit (straw, index card, ear plug, scissors, tape).</p> <p><b>Step 4:</b> The teacher will model the experiment as students are completing the experiment. The teacher will ask the question: “How can the shape affect how you hit the target?” Remind students their wings (index card) need to help the straw fly to hit the target and to be creative with their shapes.</p> <p><b>Step 5:</b> The teacher will walk students to the designated area with their rocket launchers and targets. The teacher will allow students to set up their targets with tape (within reasonable distance). The students will test out the straw rocket launchers- students can move targets and move angles to hit the target.</p> <p><b>Step 6:</b> Take students back into the classroom: Fill out the “L” part of the KWL chart. Ask students, “What did we learn from this experiment?”</p>
<p><b>Explain:</b></p>	<p><b>Day 3:</b></p> <p><b>Step 1:</b> For further explanation, the teacher can introduce the key concepts and vocabulary used in this lesson plan. The</p>

	<p>teacher will ask students, “How did our wings help our straw fly and hit the target?” “What did we need?”</p> <p><b>Step 2:</b> After gathering student answers, show the video <i>Potential and Kinetic Energy - Law of Conservation of Energy – Video for Kids</i>. Discuss how energy makes wings fly. Discuss how the energy makes the wings on our straw fly.</p> <p>Or: go over vocabulary and have students think-pair-share their ideas.</p>
<p><b>Extend:</b></p>	<p><b>Day 3 Cont.:</b></p> <p><b>Step 1:</b> To extend knowledge, students can work with partners or groups to discuss how different shapes could have gotten different results.</p> <p><b>Step 2:</b> Reference the “KWL” chart and share what we know.</p> <p><b>Step 3:</b> Encourage students to develop different shapes and ask how the distance would be affected with using different shaped fins.</p>
<p><b>Evaluation:</b></p>	<p><b>Day 4:</b></p> <p><b>Step 1:</b> At the beginning of this lesson, go over the “KWL” chart. Go over section “K” and have students choral read. Go over section “W” and have students choral read. Go over section “L” and have students choral read.</p> <p><b>Step 2:</b> Have students pair-share about what they have learned over the past days. Encourage students to talk about key concepts and ideas.</p> <p><b>Step 3:</b> Have students “retell” as a means of gauging understanding. In groups, students will show the teacher their rockets and straws from the day prior and retell what happened during their experiment.</p> <p>Example questions to guide this assessment:</p> <ul style="list-style-type: none"> <li>- Ask about fin shape</li> <li>- Ask about fin placement</li> <li>- Ask about different angles and what happened when the straw rockets were launched at these angles</li> </ul>