

STEM – CAPSTONE PROJECT

Grade	6 – 8																			
Title	Playground																			
Time Required	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Frame the Challenge</td> <td style="text-align: right; padding: 5px;">6 min</td> </tr> <tr> <td style="padding: 5px;">Introduce Playground Design</td> <td style="text-align: right; padding: 5px;">3 min</td> </tr> <tr> <td style="padding: 5px;">Introduce the Design Challenge</td> <td style="text-align: right; padding: 5px;">3 min</td> </tr> <tr> <td style="padding: 5px;">Brainstorm</td> <td style="text-align: right; padding: 5px;">5 – 7 min</td> </tr> <tr> <td style="padding: 5px;">Consolidate Ideas</td> <td style="text-align: right; padding: 5px;">5 - 7 min</td> </tr> <tr> <td style="padding: 5px;">Create a Concept Sketch</td> <td style="text-align: right; padding: 5px;">10 -15 min</td> </tr> <tr> <td style="padding: 5px;">Share Solutions</td> <td style="text-align: right; padding: 5px;">10 min</td> </tr> <tr> <td style="padding: 5px;">Debrief</td> <td style="text-align: right; padding: 5px;">8 min</td> </tr> <tr> <td style="text-align: center; padding: 5px;">Total</td> <td style="text-align: right; padding: 5px;">60 min</td> </tr> </table>		Frame the Challenge	6 min	Introduce Playground Design	3 min	Introduce the Design Challenge	3 min	Brainstorm	5 – 7 min	Consolidate Ideas	5 - 7 min	Create a Concept Sketch	10 -15 min	Share Solutions	10 min	Debrief	8 min	Total	60 min
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Key concepts	<ul style="list-style-type: none"> • Working principle • Applications • Advantages 																			
Skills	Brainstorming, problem-solving, design thinking																			
Activity	Making a Playground using Simple Machines																			
The Challenge	<p>The school’s playground is flooded, and the students cannot go out to recess. Students learn about the different states of matter and how water changes. They use this knowledge, along with research about natural disasters, to come up with an engineering solution that prevents playground flooding. They plan and design a model, test it, and share results. After sharing results, they redesign and complete at least two more trials to find the optimal solution.</p>																			

Learning Objective	<p>After completing this activity,</p> <ul style="list-style-type: none"> ✓ Students will know the steps of the engineering design process. ✓ Students understands the working principle of simple machines. ✓ Students will apply their knowledge to build a playground. ✓ Students will plan a solution to the playground flooding based on research of flooding in other geographical regions.
About the activity	<ul style="list-style-type: none"> ➤ Students apply the mechanical advantages and problem-solving capabilities of simple machines (wedge, wheel and axle, lever, inclined plane, screw, pulley). ➤ Student teams use their knowledge to design playground using simple machines. This involves brainstorming ideas on paper, building models with LEGO, bricks or other materials, and explaining their ideas to the class in five-minute presentations.
Pre requisite Knowledge	<p>Knowledge about:</p> <ul style="list-style-type: none"> • States of Matter • Natural disasters • Measurement • Shapes
Materials Required	<ul style="list-style-type: none"> ▪ Straws ▪ Coffee stirs sticks ▪ Cardboard ▪ Pushpins ▪ Foam block

	<ul style="list-style-type: none"> ▪ Peat pots ▪ String ▪ Paperclip ▪ Screw hooks ▪ Spool ▪ Foam cylinder
<p>Procedure</p>	<p>Children will <i>watch a video</i> about simple machines.</p> <p><i>Children will be presented with the Challenge:</i></p> <p>To design a playground that solves the issue of natural disasters.</p> <ul style="list-style-type: none"> ➤ They will be working in groups. ➤ At first, they will be discussing and defining the problem. Students will ask themselves what the challenge is and what constraints they have. Teacher to lead a short discussion so that students can define the challenge together. ➤ They will be shown the materials they have available for them to use. ➤ The next stage of the lesson is brainstorming their ideas. Considering all options. This will be done collaboratively. As a group they select the most promising solution. ➤ They will design their prototype, either using an app or drawing the idea, then making it. ➤ Students will use pencil and paper to ‘plan’ a sketch of their playground, labelling each part to show where the materials will be used.

	<ul style="list-style-type: none"> ➤ The prototype will be put to the test and discussions will follow on how the prototype could be improved. ➤ The following are some of the measures to control flood: <ul style="list-style-type: none"> • Not building in flood plains or building above flood levels. • Building on higher ground. • Protect and/or create more woodlands. • Introduce water storage ideas. • Improve river/ocean channels. ➤ Finally, they will communicate their solution, in the form of a presentation to the class.
<p>Overview</p>	<p>Introduce the activity by writing on the board.</p> <ul style="list-style-type: none"> ❖ <i>The real-life problem:</i> The rain has flooded our playground, which means we cannot go outside to play! ❖ <i>Objective/Challenge:</i> Create a playground model and use materials to engineer a flood prevention device. ❖ <i>Constraints of the challenge/problem:</i> Students can only use the materials provided. They also have a limited amount of time each day to research, design, build, test, and reiterate their designs.
<p>STEM Connect: Science</p>	<ul style="list-style-type: none"> ➡ Working principle of Simple machines ➡ Applications and Advantages ➡ Why have I been given these materials to use?
<p>Mathematics</p>	<ul style="list-style-type: none"> ➡ Geometry ➡ Measurements
<p>Engineering</p>	<p>Using the Design Processes.</p>

Technology	Design a playground using CANVA or similar application.
21st Century Skills	<ul style="list-style-type: none"> • Critical thinking • Communication • Collaboration • Creativity • Problem Solving
Assessments & Worksheets	<p>Pre – Activity Assessment</p> <p><i>KWL:</i> Have students fill in the “What I Know” and “What I Want to Know” columns of the KWL Chart.</p> <p>Activity-Embedded Assessment</p> <p><i>Class monitoring:</i> Take time to evaluate the construction process among each group and provide feedback when necessary, particularly if a group is struggling.</p> <p>Post-Activity Assessment</p> <p>Ask each team: <i>“Do you need to redesign and build again? What would you do differently? What would you keep the same?”</i></p> <p><i>KWL:</i> Have students fill in the “What I Learned” column of the KWL Chart.</p>

Extensions:

Story and Journey Map: Have students write a story and/or draw a journey map of their personal experience in the new playground. What would they do when they get to the playground? What are some of the activities that they would participate in? Have them consider the feelings and emotions of their personal as well as their interactions with others.