

Unit overview	Duration
<p>Through this unit of work Stage 3 students will learn the skills needed to participate in collaborative STEM environments. Each week they will focus on a specific skill and will apply it to the STEM activity that will carry them throughout the term.</p> <p>The STEM Project will be for students to design and make a boat for the 21<sup>st</sup> Century. They have been hired by an engineering company who work with environmentalists called Future Technologies. They are famous for applying science principles to develop innovative ways of solving problems. They are currently exploring the problem of what to do when the polar icecaps melt and most of the globe is underwater. They believe that the solution lies in Eco-power, using the Earth's natural forces and resources to create machines that float and generate propulsion.</p>	<p>10 weeks Detail: 1 Hour a Week (Thursday afternoon)</p>

Outcomes	Content
<p><b>Mathematics K-10</b></p> <ul style="list-style-type: none"> <li>› MA3-1WM describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions</li> <li>› MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations</li> <li>› MA3-3WM gives a valid reason for supporting one possible solution over another</li> </ul> <p><b>Science and Technology K-6</b></p> <ul style="list-style-type: none"> <li>› ST3-1WS-S plans and conducts scientific investigations to answer testable questions, and collects and summarises data to communicate conclusions</li> <li>› ST3-2DP-T plans and uses materials, tools and equipment to develop solutions for a need or opportunity</li> <li>› ST3-3DP-T defines problems, and designs, modifies and follows algorithms to develop solutions</li> </ul> <p><b>Science K-10 (inc. Science and Technology K-6)</b></p> <ul style="list-style-type: none"> <li>› ST3-1VA shows interest in and enthusiasm for science and technology, responding to their curiosity, questions and perceived needs, wants and opportunities</li> <li>› ST3-4WS investigates by posing questions, including testable questions, making predictions and gathering data to draw evidence-based conclusions and develop explanations</li> <li>› ST3-5WT plans and implements a design process, selecting a range of tools, equipment, materials and techniques to produce solutions that address the design criteria and identified constraints</li> </ul>	<p><b>Stage 3 - Digital Technologies</b></p> <p><b>Working Scientifically</b></p> <ul style="list-style-type: none"> <li>▪ compare data with predictions</li> </ul> <p><b>Design and Production</b></p> <p>Identifying and defining</p> <ul style="list-style-type: none"> <li>▪ examine and critique needs, opportunities or modifications using a range of criteria to define a project</li> <li>▪ examine and determine functional requirements to define a problem</li> <li>▪ identify data required to formulate algorithms to improve a process (ACTDIP017)</li> </ul> <p>Researching and planning</p> <ul style="list-style-type: none"> <li>▪ develop, record and communicate design ideas, decisions and processes using appropriate technical terms</li> <li>▪ manage projects within time constraints</li> <li>▪ design, modify and follow simple algorithms</li> <li>▪ extend sequences of steps to provide a series of possibilities through branching</li> <li>▪ develop solutions through trialling and refining using iterations (ACTDIP019)</li> </ul> <p>Producing and implementing</p> <ul style="list-style-type: none"> <li>▪ develop project plans that consider resources when producing designed solutions individually and collaboratively (ACTDEP028)</li> <li>▪ work collaboratively to share, appraise and improve ideas to achieve design purposes</li> <li>▪ identify, organise and perform strategic roles within a group to solve a problem</li> </ul> <p>Testing and evaluating</p> <ul style="list-style-type: none"> <li>▪ evaluate design ideas, processes and solutions according to criteria for success (ACTDEP027)</li> </ul>

Lesson	Teaching and learning	Resources
1	<p style="text-align: center;"><b><u>INTRODUCTION</u></b></p> <ul style="list-style-type: none"> <li>▪ Students are shown the STEM Movie to introduce and engage them in the task at hand.</li> <li>▪ They are then to write 3 I ‘Wonder’ questions about the clip in their reflective journals. They share these in small groups of 4 or 5.</li> </ul> <p><b>Whole class:</b></p> <ul style="list-style-type: none"> <li>▪ Jointly create some expectations around group work using a Y chart:</li> <li>▪ How do we take turns?</li> <li>▪ How do we politely agree or disagree?</li> <li>▪ What happens if someone makes a mistake?</li> <li>▪ How should we talk to each other/discuss in a group?</li> </ul> <p><b>In Groups:</b></p> <ul style="list-style-type: none"> <li>▪ Envelopes are placed around the hall with 4-5 names on them. They are to find their envelope and sit as a group. Students open their envelopes and then as a group decide on which role they would like to undertake for the fortnight and fill it out in their group booklet.</li> <li>▪ Students read the design brief. As a group they create a KW chart (Know &amp; questions they need to know in order to be successful. A few of these can be shared as a whole group, but each group is in charge of researching what they need to know to be successful.</li> <li>▪ Students then need to use iPad/Laptops to find the answers to some of the questions that they need to know and look at images of different transportations to understand the structure of what is needed to be able to move on water.</li> </ul> <p><b>Reflective journal:</b></p> <ul style="list-style-type: none"> <li>▪ What did we learn about today?</li> <li>▪ What is something new that I found out and didn’t know before?</li> <li>▪ What did we achieve as a group?</li> <li>▪ What was a challenged we faced?</li> <li>▪ Did we overcome this challenge? How/Why not</li> <li>▪ What do we need to do next week to continue our STEM journey?</li> </ul>	<ul style="list-style-type: none"> <li>▪ <a href="#">STEM movie</a></li> <li>▪ STEM Design Brief in envelopes with student group names</li> <li>▪ Role cards in envelopes</li> <li>▪ KW Charts for each group A3</li> <li>▪ Group booklet</li> <li>▪ iPad/laptops</li> <li>▪ Reflective journal (Each student)</li> </ul>
2	<p style="text-align: center;"><b><u>DESIGN BRIEF</u></b></p> <p><b>Whole class:</b></p> <ul style="list-style-type: none"> <li>▪ Come up with a set of potential limitations (wind, weather, amount of materials, cost of materials etc)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Materials (the materials are limited because they are the last remaining materials and there is a cost to each of them)</li> <li>▪ Group booklet</li> </ul>

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	<p><b>In groups students need to:</b></p> <ul style="list-style-type: none"> <li>▪ Think about the problem/task at hand and write it in their own words.</li> <li>▪ Consider what has to happen to make it functional (weight, materials, distribution, shape)</li> <li>▪ Create success criteria for their design (how will they know they have been successful)</li> <li>▪ BEGIN BRAINSTORMING</li> </ul> <p><b>BRAINSTORMING/SOLUTION:</b></p> <ul style="list-style-type: none"> <li>▪ Students are able to see the materials that are available to them but they are not allowed to touch them. They are allowed to brainstorm a wish list of materials that they might want to use and how many of each of them. Students are given a \$10,000 dollar budget BUT there are limitations to how many of each material they can have due to the materials being limited.</li> <li>▪ Students brainstorm and discuss ideas for design solutions using available materials.</li> </ul> <p><b>Reflective journal:</b></p> <ol style="list-style-type: none"> <li>1) What did we learn about today?</li> <li>2) What is something new that I found out and didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenged we faced?</li> <li>5) Did we overcome this challenge? How/Why not?</li> <li>6) What do we need to do next week to continue our STEM journey?</li> </ol>	<ul style="list-style-type: none"> <li>▪ Reflective Journal</li> </ul>
3	<p style="text-align: center;"><b><u>PLANNING</u></b></p> <p><b>Whole class:</b></p> <ul style="list-style-type: none"> <li>▪ Students are taken through a mini drawing lesson on how to sketch a plan view (top view), side views, rear views- <b><i>Either by teacher or can find a youtube clip.</i></b></li> </ul> <p><b>In groups:</b></p> <ul style="list-style-type: none"> <li>▪ Each group member selects a new role for the two weeks</li> <li>▪ Each member of the group is to create a labelled design using the Sketch sheets of what they think their transportations should look like.</li> </ul> <p><b>Whole class:</b></p> <ul style="list-style-type: none"> <li>▪ Teacher to go through how to critique someone's else's work to provide feedback that will assist them. Students need to understand the power of feedback and how to make it constructive to support each other in what they have created.</li> <li>▪ Go through Teach Starter Critique Sentence starters.</li> </ul> <p><b>In groups:</b></p> <ul style="list-style-type: none"> <li>▪ With post-it notes each student write a positive, a suggestion and an improvement</li> </ul>	<ul style="list-style-type: none"> <li>- <u>Sketch Sheets (Plan, side, rear)- each group member and a final one</u></li> <li>- Post it notes for each group</li> <li>- Video clip on how to sketch each view</li> <li>- <u>Teach Starter Critique sentence starters</u></li> <li>- Group booklet</li> <li>- Reflective journal</li> </ul>

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	<p>questions</p> <ul style="list-style-type: none"> <li>▪ Students then read the feedback and adjust their designs accordingly.</li> <li>▪ In groups, students look at all possible design briefs and decide on which one will be the most effective for their group design. They are allowed to take aspects from each other's transportation designs and create one FINAL GROUP design.</li> </ul> <p><b>Reflective journal:</b></p> <ol style="list-style-type: none"> <li>1) What did we learn about today?</li> <li>2) What is something new that I found out and didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenged we faced?</li> <li>5) Did we overcome this challenge? How/Why not</li> <li>6) What do we need to do next week to continue our STEM journey?</li> </ol>	
4	<p style="text-align: center;"><b>CONSTRUCT</b></p> <p><b>Whole class:</b></p> <ul style="list-style-type: none"> <li>▪ Go through the whole group expectations again around group work and how to talk to each other.</li> </ul> <p><b>In groups:</b></p> <ul style="list-style-type: none"> <li>▪ Students select roles for the next two weeks.</li> <li>▪ Students finalise their design (in group booklet) and write a list of materials and the total cost on their budget sheet. The money saved equates to the amount of bottle caps each group receives for testing</li> <li>▪ Students send the materials master up to collect the materials needed and the bottle caps they get.</li> <li>▪ Students will begin the construction of their designs.</li> </ul> <p><b>Reflective journal:</b></p> <ol style="list-style-type: none"> <li>1) What did we learn about today?</li> <li>2) What is something new that I found out and didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenged we faced?</li> <li>5) Did we overcome this challenge? How/Why not</li> <li>6) What do we need to do next week to continue our STEM journey?</li> </ol>	<ul style="list-style-type: none"> <li>- Group expectations</li> <li>- Group booklet</li> <li>- Materials</li> <li>- Blow up pool</li> <li>- Reflective journal</li> </ul>
5	<p style="text-align: center;"><b>FAIR TESTING</b></p> <ul style="list-style-type: none"> <li>▪ If students have not yet completed their construction then give them some time at the beginning of this lesson.</li> </ul>	<ul style="list-style-type: none"> <li>- Group booklet- planning a fair test, evaluation checklist</li> <li>- Pool</li> </ul>

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	<ul style="list-style-type: none"> <li>▪ Have students take a photo of their first boat</li> </ul> <p><b>Whole class:</b></p> <ul style="list-style-type: none"> <li>▪ What is a fair test?</li> <li>▪ Why do we need to make sure that we are carrying out a fair test?</li> <li>▪ Go through the planning a fair test sheet as a whole class and choose ONE variable that we will change as a class (1) wind power-fan AND (2) amount of bottle caps- testing their own means of propelling)</li> </ul> <p><b>In groups:</b></p> <ul style="list-style-type: none"> <li>▪ 2 Trials: Test their prototype with wind power (medium) &amp; change amount of bottle caps</li> <li>▪ 2 Trials: Test their prototype without the wind power &amp; bottle caps (propeller)</li> <li>▪ Evaluate their boat using the evaluation checklist. Have students identify any problems that they have noticed.</li> <li>▪ Students will then use the evaluation checklist to update their designs and change what they might need to change on their prototypes before the final trials.</li> <li>▪ Take pictures of the changes that they made to their prototype</li> </ul> <p><b>Reflective journal:</b></p> <ol style="list-style-type: none"> <li>1) What did we learn about today?</li> <li>2) What is something new that I found out and didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenge we faced?</li> <li>5) Did we overcome this challenge? How/Why not</li> <li>6) What do we need to do next week to continue our STEM journey?</li> </ol>	<ul style="list-style-type: none"> <li>- Fan</li> <li>- IPad (pictures)</li> <li>- Reflective Journal</li> </ul>
6	<p style="text-align: center;"><b>FAIR TESTING</b></p> <p><b>Whole class</b></p> <ul style="list-style-type: none"> <li>▪ Go through the importance of making changes to your design to make it better and that scientists and engineers often change their plans to make them as effective as possible.</li> </ul> <p><b>In groups:</b></p> <ul style="list-style-type: none"> <li>▪ Each group finalises their final boat and begins their second round of fair testing</li> <li>▪ 3 trials: medium wind power (change amt bottle caps)</li> <li>▪ 3 trials: propeller (change amt bottle caps)</li> <li>▪ Fill in data into their second fair testing sheet</li> <li>▪ Make final observations about their boats. What worked really well? What didn't work so well? How could that be changed in the future?</li> </ul>	<ul style="list-style-type: none"> <li>- Group booklet: planning a fair test, whole class results table, advertisement planning</li> <li>- Reflective journal</li> </ul>

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	<p><b>Whole class:</b></p> <ul style="list-style-type: none"> <li>▪ Reporters share their final results with the whole class</li> <li>▪ Each group recorder writes down the whole classes results on the results table</li> <li>▪ As a class, form a recommendation for a whole class design which incorporated the most successful features.</li> </ul> <p><b>Reflective journal:</b></p> <ol style="list-style-type: none"> <li>1) What did we learn about today?</li> <li>2) What is something new that I found out and didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenged we faced?</li> <li>5) Did we overcome this challenge? How/Why not</li> <li>6) What do we need to do next week to continue our STEM journey?</li> </ol>	
7	<p style="text-align: center;"><b><u>REFLECT/ACT</u></b></p> <p><b>Whole class</b></p> <ul style="list-style-type: none"> <li>▪ Go through the design aspects that we selected to make the ultimate prototype for the Future Technologies Company.</li> </ul> <p><b>Individually</b></p> <ul style="list-style-type: none"> <li>▪ Students need to do a final side, back and top view of the prototype. Try using google Sketchup to create a 3D view of the class prototype</li> </ul> <p><b>In groups</b></p> <ul style="list-style-type: none"> <li>▪ Create an advertisement for the class prototype. You need to include the design specifications and justifications, the materials and come up with a creative name and jingle to sell the boat.</li> <li>▪ Each group needs to create a poster to sell the boat that would go into a magazine AND a quick 30 second TV ad.</li> </ul> <p><b>Reflective journal:</b></p> <ol style="list-style-type: none"> <li>1) What did we learn about today?</li> <li>2) What is something new that I found out and didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenged we faced?</li> <li>5) Did we overcome this challenge? How/Why not</li> </ol>	<ul style="list-style-type: none"> <li>- Sketch sheets FINAL prototype</li> <li>- Group booklet- advertisement planning</li> <li>- Laptops (Sketchup)</li> <li>- iPads (TV advertisement)</li> <li>- Reflective journal</li> </ul>
8	<p style="text-align: center;"><b><u>PRESENTATION TIME</u></b></p> <ul style="list-style-type: none"> <li>▪ Groups present their ads and posters to the whole group</li> </ul> <p><b>FINAL Reflective journal:</b></p>	<ul style="list-style-type: none"> <li>- Reflective journal</li> </ul>

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	<ol style="list-style-type: none"> <li>1) How did I find this whole process?</li> <li>2) What is something new that I found out and didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenge we faced?</li> <li>5) What was a challenge that I had to overcome as an individual?</li> <li>6) What is something I have learned about myself throughout this journey?</li> </ol>	

Assessment	Evaluation
<p>Ongoing formative assessment will occur through the course of the unit. Students will also complete a reflective journal at the end of each session and will answer the following questions:</p> <ol style="list-style-type: none"> <li>1) What did we learn about today?</li> <li>2) What is something new I learned today that I didn't know before?</li> <li>3) What did we achieve as a group?</li> <li>4) What was a challenged we faced?</li> <li>5) Did we overcome this challenge? How/Why not</li> <li>6) What do we need to do next week to continue our STEM journey?</li> </ol>	