The Great Boat Challenge! **By Jen Eddie (later lessons in this unit are still under construction)**

Hello Everyone!

This is a simplified unit plan, where I have included the lessons for Families to look at. There are resources that you'll have to be sent, or given by your contact teacher, or Ms. Eddie. Please let me know if you have any questions about the unit. I have listed possible support teachers below (beyond your contact person at LSS).

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Lessons

Lesson #	Brief Summary	Materials/Resources Needed	Concepts	Access Points	Lesson
1. Growth Mindset	Students explore the idea of what growth and fixed mindsets are. This will help with the feedback element later in the unit.	Fun, Cute Video Series on Growth/Fixed Mindset: https://ideas.classdojo.com/b/growth-mindset More academic example: https://www.youtube.com/watch?v=M1CHPnZfFmU Test your skills clip: https://www.youtube.com/watch?v=3vz6HU1LlOU	Mindset helps us grow. Feedback helps us create more beautiful products/work.	Need internet. Could submit writing by email, or hand in a hard copy.	Ask yourself, "do I know what growth mindset is?" Can you explain it? How does it change how successful we are? Choose one of the 2 Mindset series to watch. You can also go on youtube and check out what is on there. Anything under Carol Dweck should be more academic. When you have a good idea of what it is, try the bottom link called 'test your skills' and see if you can correctly identify all the characters' mindsets. Spoiler alert, the answers are in the last few seconds of the clip. Respond to today in a way that is meaningful to you. Some ideas are drawing, writing, submitting a song with lyrics that aligns with your opinions.

2. Critique/Revision	During this process, students will have to receive feedback on their prototypes. How to give good feedback is an excellent mini lesson to review.	A short summary with Ron: https://www.youtube.com/watch?v=cWMH_X4IvOk Austin's Butterfly: https://www.youtube.com/watch?v=hqh1MRWZjms&t=244s	Kind, specific and helpful feedback helps us create the most beautiful work.	Internet Access	What is feedback? How does feedback make you feel? If I told you, 'hey, your drawing is really colourful, but could you add more detail here?' would you feel attacked? Lots of people do; however, revising work is something that helps us create really meaningful and beautiful work. A teacher named Ron Berger developed a framework of giving feedback that is kind, specific and helpful. Listen to the two clips. Respond to me and let me know how this could help your work/life?
3. Using Feedback	Students use modelling clay to create an object, and get kind and specific feedback between drafts to show how feedback can help create beautiful work.	Modelling Clay (unopened)	Feedback helps us create work that is beautiful by widening our audience.	No Access required.	Start by opening your clay. If you have playdough at home, or other colours please feel free to add them. Make sure you have your feedback sheet out and someone in the home to give you feedback at different intervals. Go over what kind and specific feedback are. Show them the Austin's Butterfly picture and explain how kind and specific feedback helped Austin to make a really amazing product. Set a timer, you have ten minutes to make a unique object. After ten minutes are up, revise your object. Now, ask for feedback from as many people as you can (3 is optimal). Now, highlight, or underline the feedback you like (try to take some from both side, but you MUST include one specific example).

					You have 3 minutes to adjust your design. Get more feedback. Revise. Reflect. Did the feedback help you? Did your product look any different from 1st draft (no feedback) to the final copy? Why, or why not? Submit photos of your feedback forms and pictures of your three drafts with your reflection.
4. The Pitch	Students are now introduced to 'the challenge' of building a boat, while learning math along the way.	Rick Mercer at the Ontario Skills Challenge: https://www.youtube.com/watch?v=rk1OqNkZh0g A second example: https://www.youtube.com/watch?v=wlfNll2Jn4E	Math is embedded in SO many real life examples. We are going to look at math while learning about, and building, a boat to float your own body weight (or you can add family members if you make it through the first minute).	Internet	Watch the two clips provided. What do you think will separate success from failure in this challenge? Predict what you will need to get good at. What Math do you think you'll need to do well in this challenge? Email me your answer.

5. 2-D and 3-D object review	Students review the different 2-D and 3-D shapes.	2-D shape review: https://www.khanacademy.org/math/basic-geo/basic-geometry-shapes/basic-geo-properties-shapes/v/recognizing-shapes Review properties of 3-D shapes on this page. You have the option of watching, doing a quiz, or reading: https://www.bbc.co.uk/bitesize/topics/zjv39j6/articles/zgqpk2p Video game of 3-D shapes review: https://www.topmarks.co.uk/Flash.aspx?a=activity20	2-D and 3-D shapes have many different properties. In order to do higher level math, you must know the properties, and types of shapes (both 2 and 3 dimensional).	Internet	Do you know your 2 and 3 dimensional shapes? If yes, skip to the next lesson. If the answer is maybe, whip through these examples/games. If they answer is no, take your time through these examples/games.
6. Tinfoil Test (Surface area and squares)	Students will each get the same size tinfoil and be asked to make a floating 'boat'.	Area/Surface Area of a Square: https://www.youtube.com/watch?v=xCdxURXMdFY&list=PLyNKTd2ugSr9u9uYGi-BWuEdFSM-lxNYb	Surface area can help, or hinder, how well something floats.	Internet Tinfoil Light objects to test the buoyancy of the 'boat'.	What is surface area? What makes something float better - something spread out, or a tight ball? If you could guess at that question, you already know more about surface area than you thought. Watch the clip till 3 minutes and 52 seconds. Now, can you answer the top question? Have an idea about the second question? Now you begin to build. You should have 1 or 2 pieces of tinfoil. Using only tinfoil, build a 'boat' that you can put in a bowl or tub to test how many pennies or paperclip, or found materials it can hold.

					When you have finished your boat, try sinking it. Is is really good at holding weight? What would make it better? Try to get some kind and specific feedback from someone in your home on what you could alter. Fill in the feedback form. If you cannot find anyone at home to give feedback, try to set up contact with your sponsor teacher. Make a second prototype and try again. Did it work better? Assessment: Upload a video/photo of your best prototype. Write a short reflection on how it went. Include the feedback you were given. When done, watch the video clip to completion so you know how to calculate area.
7. Sink or Swim	Students explore common household objects that they predict will sink, or swim.	Buoyancy: https://www.youtube.com/watch?v=nMlXU97E-uQ	Different measures affect an object's buoyancy.	Internet	What makes something float, or sink? Do any scientific terms come to mind? Fill a bucket, or big bowl. Lay your household items out. Take a photo before you start. Talk it through, why will some things float, and some things sink? Make a prediction for each item. Watch the clip. Did it make you change any predictions? Test your objects, submit whether you were right or not via email, paper, or other means.

8 and 9 Squares, square roots, cubes, cube roots.	Insert squares, square roots, cubes, cube roots.	Squares and Square Rootshttps://www.youtube.com/watch?v=xCdxURXMdFY: Cubes and Cube Roots: https://www.youtube.com/watch?v=qJwecTgce6c	Students will learn how to calculate squares and square roots. How are square roots related to one another? What is the relationship between squares and cubes? What is the relationship between cube roots, and square roots?	Internet access Worksheets Calculator, or calculator on an iPhone. ** Can we send home unifix cubes???	Part 1: What is the square of a number? Squaring a number is just making a square shape (equal side length of a number). For the number 4, when squared, there would be 16 units inside, with each side length being 4. In math, we would say 4 squared is 16. Try making squares for all the numbers from 1-12 on the graph paper provided. Put the answer inside (the answer being the total number of square units inside the square). Have someone show you the square function on a calculator. We can also say that 4 is to the power of 2 since it is multiplied by itself 2 times (4*4). Now, using the same squares you just created, we are going to learn about square roots. For square roots, you take the total units, and are asking what the side length is. For example, the square root of the number 16 is 4 (the side length is 4). Write the square root of each square. Have someone show you the square root function on your calculator. Need some help? Call, or email us. I've also included a video from Math Antics. Submit your work by photo, scan, or have it delivered to school. Extras: Practice square root and squaring numbers with a cut and paste. Spicy: Complete the worksheet on exponents. Part Two: A cube is a 3 dimensional shape, and a square is a two dimensional shape. A good way to remember that you have to multiply a number by itself 3 times to make a cube is to remember that cubes are a 3-D shape. To cube the number 4, you would multiply it by itself 3 times. The answer is 4*4*4 = _____. Try it with another number. Find the cube button on your calculator. When we cube a number, we are finding

					the volume (what's inside of it). Watch the clip on volume. A cube root is the opposite of cubing a number. So you know what the volume of a cube is, but you want to know the side length. Use the cubic root button on your calculator. Too confusing? Watch the clip from Math Antics on cubes. Practice: Complete the practice on exponents Spicy Practice: Complete the partner problems for cube and square roots.
10. What is Pi?	Students learn about Pi, and can make pie. They learn the terms radius, diameter, perimeter, and circumference.	Video: https://www.youtube.com/watch?v=cC0fZ_lkFpQ Pie filling, pie crust, pie tins.	Students learn what Pi is, while learning the terms associated with working with circles.	Internet <u>Materials to make a pie. (PLEASE ORDER AHEAD FROM YOUR TEACHER.)</u>	Watch the flip from Math Antics You should know what the terms radius, diameter, circumference, and Pi are referring to. Make a pie, for your pie, get out a ruler and measure the diameter, radius, and circumference. Snap a photo and write on your photo, or take photos of each measurement. While your pie is baking, try some calculations with Pi to find the surface area of a circle. Practice one: Area of a circle Spicy Option: Area of a circle - spicy. Bonus: Find the area of your pie top using the calculation for area on the practice sheets.

11. Nets	Students will create nets for 3-D shapes and then make an initial prototype of a boat using the shapes they predict will be the most useful.	Glue stick Scissors Paper nets for the following shapes: Cylinder Cube Rectangular prism Cone Pyramid Triangular prism Challenge clip: https://www.youtube.com/watch?v=nMlXU97E-uQ	Geometric shapes are in the world all around us. Shape can inform functionality.	Internet needed for the challenge clip only.	Make the net shapes. Which ones do you think would make the best boat? Why? Create a mutant boat prototype. Why did you use what you used? Use as many of one type of shape as you want. If you didn't include some shapes tell me why not. Try and link your ideas to volume. Watch the clip. Would you change your design now? Submit your 'mutant' boat, made of nets given. Challenge: Get someone to give you feedback (use form given) and submit along with your 'mutant' boat.
12, 13. Prototype One! (Two Days)	Looking at prototype one, made of cardboard, we will practice surface area and volume calculations.	Cardboard Tape (Packing, or Duct Tape) ** Please use sparingly, this may be the only roll. Tape measure or ruler *School can print and laminate rulers to send home. Calculator	Students will build prototype one in a scale format. They will have to decide what they want their boat to look like and begin the design process. When done, they will calculate the surface area, and attempt to find the volume of their boat (refer back	Internet Access for the elements of boat design. *This is optional, you can also just build however you want.	Day One: Today is the start of the 'real deal'. You are going to build a prototype of the boat you have imagined so far. There are a few different categories you could be judged: Decoration: Is your boat creatively decorated? This can be the shapes you use (more geometric shapes = great), the colours you use, or anything that sparks joy in the audience. Floatation:

		*can use one on your phone. Feedback form Design elements of boats clip:	to the shapes of nets lesson.)		Your boat will float for a long period of time with a person in it. After a period of time (1-3 minutes) you will add more people to the boat. Speed: Your boat cuts through the water well, and covers the distance challenge quickly. Once you have decided which design categories you'd like to focus on (speed, floatation, or decorative) make a plan for what you'd like to build BEFORE you start cutting cardboard. Once your plan is ready, have someone look it over to give you some feedback (kind and specific). Start building! Day Two: Calculate the surface area of your prototype. Include pictures of your prototype, the different faces of your boat labelled (example would be the bottom is labelled A. Surface A has a surface area of _____ here is my calculation.) Try to figure out the volume of your prototype. Try to 'close in' your shapes. If you have a rectangle as a boat shape, use the formula for a rectangular prism. If you combined rectangular prism with a pyramid shape, use both those calculations. Totally confused? Zoom in, or ask for help. We are here for you. Submit your answers via email, physical paper, or other method.

14, 15 Measurement Conversions (Two Days)	Measurement lesson. Measure in non-standard units, then in cm, then show how to convert from unit to unit.	Units of Measurements: https://www.youtube.com/watch?v=ZNX-a-5jGeM	Students will begin to convert units by making paper airplanes.	Internet Access for resources.	Welcome to measurement conversions! Are you sick of Math Antics videos yet? Watch the clip to 1:45. Find something super funny, random, and appropriate in your house and measure something with it. The Math Antics man references donuts, and hot dogs. See if you can one-up him. Now, finish the video. To practice conversions, you'll be making paper airplanes today. You'll need a tape measure, or a long ruler. Include someone else and have some fun! Refer to the Top Floor lesson on Airplanes. Day Two: Watch the clip from Khan Academy on conversion of units. I've included a little cheat sheet for moving the decimal point. It's a different way of doing it, but people at home helping you may have learned this method. Using the large paper given, have someone trace you, or trace someone else (or, if you're really stuck, draw and imaginary friend). Measure each of the given areas from the practice page. Convert the units as described on the page. Hand in:)

16-18 Pythagorean Theorem	Students include a right angle triangle in their design somewhere. Please go to the lesson on Pythagorean Theorem in the Math folder (author is Kim Halayko.)	See lesson in Math folder.	See lesson in Math folder.	See lesson in Math folder.	Follow the lesson in the math folder by Kim Halayko. Submit to your contact teacher for assessment.
19 Test Day	Test your design with household items. Video your test, and then get feedback on your design. Include some information on parts of boats.	Resources: Household items to use as 'weight'. A camera to take pictures or video of your test.	The shapes of items affect their volume and buoyancy.	No internet needed.	Well, here we go! The first real test. Get your prototype boat out. Make sure you have photographic proof of how awesome it is before we attempt to sink it. Gather some household items for weight. I like to put in many items of the same weight one at a time. For example, you could use forks, or spoons. Predict how many of the items your boat will hold. Write it down. Start a timer. Test! Record your findings. - How many items did your boat hold? More or less than you predicted? - How long did it take to sink your boat? - If you took photos, submit your top three. Submit answers to questions by email, physical copy, or other method.

20 Scale it Up	Go over ratio, and have students scale their boats up by 2, 4, or 10 times for prototype 2.				
The Final Scale Up	Test prototype 2 and figure out what you want your final design to be, and scale accordingly.				

The Finale	Make a plan for the FINAL TEST!				

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