**STEM Challenge - Catapult Lesson Plan**

Name of Teacher: Tim Barnes

Date: 11/20/2018 Time: 5-7 Days STEM

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| **Stage 1 – Desired Results** |
| **Lesson topic:**  Catapult Challenge |
| **Essential Questions:**  How does planning and execution affect the intended outcome of a project? Once a blueprint is made, how can you improve performance without changing the original design concept//final product concept? What can be done to make the object fly the furthest distance possible? |
| **Lesson Objectives:**  Students will design a catapult using the assigned materials Students will build a catapult using the assigned materials Students will test and modify the built catapult to increase performance Students will discuss and explore the results of the build, modification, and launch Students will measure, evaluate, and analyze results to find furthest launch |
| **Standards:** |
| **Stage 2 – Assessment** |
| **Assessments:**   * Informal Formative Assessments throughout unit (i.e. classroom observations, questioning)   + Observation   + Group work   + Participation   + Idea Sharing   + Physical build contributions   + Testing and modifications * Formal assessments on:   + Distance of launch   + Improvement after modification   + Group Evaluation   + Individual observations * Individual Course Summative Assessments   + Record, analyze, and present written data |

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| **Stage 3 – Learning Plan** |
| **Materials**  Per Group  Graph Paper  Instructions and material list  Ruler  12 Jumbo Popsicle sticks 8 Regular Popsicle sticks 6 Thin rubber bands 3 Medium rubber bands 1 glue stick 1 ping pong ball 1 plastic spoon and/or cup |
| **Procedures and Content Presentation**  Day 1 Explore – You will be given some, but not all of the products you are allowed to use to build the catapult as test objects. That means cut, glue, attach, expand, modify, etc… those products to test their strength, durability, force, etc… to aid you in the design process.  Day 2/3 Design/Build – Design your catapult on paper. You must submit your design for approval. It must include detailed drawings and explanations of the concept of how it will work. You must also project your expected results. Once the design is submitted and approved, you will receive your building materials and may begin building. Day 4 Test day – Test your catapult. You will have one period to test your catapult. Be sure to explore ways in which you can improve the distance achieved. For the test launch, there are no launch restrictions. Day 5 Launch day – Official, measured launches will take place. You will have to launch the test satellite three times. The group who has the furthest overall launch will be granted the contract to build the new satellite launcher at full scale. One member of each group will need to record the results of ALL groups and ALL launches for later analyzing.  Day 6 Analyze results – Study the results of all groups. In your individual groups, draw general conclusions as to why certain catapults performed how they did. What could you have done to apply other group’s concepts to your catapult? |
| **Summary and Closure**  What conclusions were made? (Direct students towards why certain machines produced better results)  Were there any concepts applied to certain machines that translated to better, or poorer, results? |

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| **Vocabulary**   * Content specific vocab Force Catapult Trebuchet Slingshot Trajectory Hypotheses  Modification Tension * Steps of design process Define the Problem Research//Exploration Brainstorm and design solutions Develop design Initial build (prototype) Test, modify, or redesign Final Product |