CASTLE COMPLEX EDP PHASE 2 PROJECT (2018-2021)
UbD STEM UNIT PLAN TEMPLATE (adapted from ONR Engineering Success in STEM Project)

Teacher's Name: Sarah Weible, April Rodriguez, Jeffery Donlon, and Joshlynn Noga	**School:** King Intermediate	**Grade Level:** 7-8th
Content Area: Science	**Course Name:** Integrated Science, and Aloha Aina Innovation Academy	**Period:** All class periods
Unit Title: Gravity Racers	**Approximate Time Frame:** 2/24-3/13 (approx. 12 days)	
Essential Vocabulary: Gravity, Friction, Acceleration, Velocity, Aerodynamic, Momentum		

STAGE 1: DESIRED RESULTS

NGSS Standard(s)
MS-PS2-2 Motion and stability: forces and interaction

Performance Expectations

- Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Dimension	Name and NGSS code/citation	Matching student task or question directly from the activity
Science and Engineering Practices (SEPs)	**Planning and Carrying Out Investigations** • Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions	Investigating, planning, and creating solutions to a problem through multiple builds.
Disciplinary Core Ideas (DCIs)	**PS2.A: Forces and Motion** • The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. • All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.	Students should gain a solid understanding of Newton's 1st Law in relation to gravity, momentum, and balance. Students should be using scale and proportion to determine the frame of reference for their solution
Cross Cutting Concepts (CCCs)	**Stability and Change** • Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.	Students will recognize the importance of stability in their moving systems and use of scaling to design a scale appropriate vehicle

Learning Goal (Student Learning Objectives): (Skills, content knowledge and understandings, values, etc.) *Students will be able to…*	Design and build a solution using scale and proportion along with a solid understanding of Newton's 1st law in relation to gravity, momentum, and balance

Essential Question(s):	Who can build the fastest car no longer than 8.5" and no wider than 5.5" to compete in the gravity racer challenge held at Castle High School?
Enduring Understandings (Big Ideas): (Broad understandings that are not tied to place, time, specific people, etc.)	● Scale and Proportion ● Newton's 1st Law ● Engineering Design Process
Other Standards/Benchmarks:	MS-ETS1-2,3,4 Engineering Design

STAGE 2: ASSESSMENT EVIDENCE

Summative Assessment/ Performance Task	Completion of gravity racer car that successfully makes it down the racetrack and triggers the sensor. Students will also need to complete the engineering notebook.
Rubric(s) for Summative Assessment/Performance Task: (Attach documents)	½ point - Working Gravity Racer Car *will add car building rubric* ½ point - Engineering Notebook
Formative Assessments:	- Successfully complete steps of the engineering design process - Communicate process and results with others - Reflection process from one design to the next, and for the completed project
Engineering Notebook	GR7-8 Gravity Car Racers Engineering Notebook

STAGE 3: LEARNING PLAN:

The daily activities should address all aspects of the EDP, plus the communication/sharing process:**
Problem Statement (Scenario)
Ask: Need Identification, Problem Statement, Client(s), Specifications
Imagine: Research, Brainstorm Solutions
Plan: Pugh Chart, Gantt Chart, Materials, Equipment, Procedures
Create: Prototype/Model, Test
Improve: Reflect, Improve/Modify, Test

Entire EDP Project (3 weeks/ 12 class days)

ASK **Jan. 24 (½ day) -Explain Project, Scenario, Steps, & End Goal**
PLAN **Jan 24-27 (2 ½ days)**
CREATE **Jan. 28, March 2nd (1 day Period building, 1 class testing & improving)**
IMAGINE/ IMPROVE **March 3-4th (1/2 class day) Research how to improve cars/Reflect** **March 4-6th (1 ½ days) rebuilding/improving** **March 9th (1 day) Retesting** **March 10th-13th (2 days) Competition** **Day 1- compete by each class period** **Day 2- Outside of class- Compete during recess or after school between each teacher's class** **During Class-Last minute touch ups-reflection time**
COMMUNICATE** **March 13th**

Sharing Designs & Reflections in Class Periods **Prepare for Ho'ike** **Student Ho'ike- Friday, April 3rd** **April & Sarah- 3rd period** **Jeff & Joshlynn- 4th period**
Materials, Equipment and Resources Needed to Implement Unit **For all classes:** **432 Wheels** **216 Sheets of Card Stock** **400 Straws** **400 Skewers** **28 Rolls of Tape** **30 Nuts** **3 Ramps**