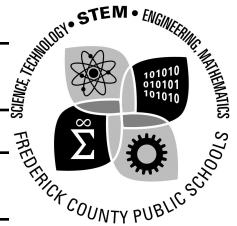


STEM Centric/ PBL Unit Template



Title of Unit: Co2 Dragsters

Grade: 8th	Subject: Problem Solving	Duration: 4 weeks
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Unit Component	Description	Details
Overview	Summary of what students will do and learn in the unit. It explains the unit's focus and real world connection. Include opportunities for student voice and choice.	Students will research the field of aerodynamics and apply their knowledge to design a UDRA (Urbana Drag Racing Association) Dragster for the championship race. They must research technology subsystems, prototyping, Newton's Laws and come up with a Co2 dragster design. Students will create a prototype design and analyze, evaluate and communicate their design to the UDRA. Once a final design has been chosen the students will create a balsa wood model of their dragster and race them again the other competitors.
Driving Question	This is an open-ended question that provokes inquiry about the core ideas for the unit. Grade-level appropriate questions that prompt intellectual exploration of the topic. This should incorporate a real world connection.	How can you design a Co2 powered dragster to win a championship race?
Content Standards	List grade appropriate Maryland State Content Standards/ FCPS Curriculum that will be addressed in the unit.	TE.PS..01 Develop an understanding of the nature, characteristics and scope of technology.* (ITEA, STL 1) TE.PS.01.01 Understand, acquire, and use new vocabulary related to technology. (VSC Reading Processes/Vocabulary) TE.PS.01.02 Explain that new products and systems can be developed to solve problems or to help do things that could not be done without the help of technology. .TE.PS.02 Develop an understanding of the core concepts of technology. * (ITEA, STL 2) TE.PS.02.01 Explain that technological systems include input, processes, output and at times feedback. TE.PS.02.02 Explain that systems thinking involves considering how every part relates to others.

		TE.PS.02.04	Explain that malfunctions in any part of the system may affect the function and quality of the system.
		TE.PS.02.05	Explain that requirements are the different parameters placed on the development of a product or system.
		TE.PS.03	Develop an understanding of the relationships among technologies and the connections between technology and other fields of study.* (ITEA, STL 3)
		TE.PS.03.01	Explain that knowledge gained from other fields of study has a direct effect on the development of technological products and systems.
		TE.PS.03.02	Recognize and explain that technological progress promotes the advancement of science and math.
		TE.PS.04	Develop abilities to assess the impacts of products and systems.* (ITEA, STL 13)
		TE.PS.04.01	Design and use instruments to gather data.
		TE.PS.08	Develop an understanding of the attributes of design.* (ITEA, STL 8)
		TE.PS.08.01	Explain that requirements for a design are made up of criteria and restraints.
		TE.PS.09	Develop an understanding of engineering design.* (ITEA, STL 9)
		TE.PS.09.01	Explain that modeling, testing evaluating and modifying are used to transform ideas into practical solutions..
		TE.PS.10	Develop abilities to apply and analyze the design process.* (ITEA, STL 11)
		TE.PS.10.01	Identify the problem
		TE.PS.10.02	Research and Brainstorm
		TE.PS.10.03	Choose the solution and justify
		TE.PS.10.04	Construct a model or prototype
		TE.PS.10.05	Test and Record Data
		TE.PS.10.06	Evaluate, Reflect and Communicate
		TE.PS.11	Select and use tools and equipment correctly and safely.*
		TE.PS.11.01	Select and use the appropriate tools and equipment in: making two-dimensional and three-dimensional representations of design solutions; forming and molding processes; machining and assembly processes.
		TE.PS.11.02	Select and use appropriate tools based on the properties of materials.
		TE.PS.11.03	Select and use tools and instruments in the testing and evaluation of design solutions.
		TE.PS.17	Develop an understanding of transportation technologies.* (ITEA, STL 18)
		TE.PS.17.01	Analyze transportation systems, such as: land; water; air; space

STEM Standards of Practice	STEM Standards of Practice will be used to guide the instructional approach. Describe how students will integrate content, engage in Communication, Inquiry, Logical Reasoning, Collaboration, apply Technology strategically)	Career Ready Practices Common Career and Technical Core 2. Apply appropriate academic and technical skills. 4 Communicate clearly, effectively and with reason. 5 Consider the environmental, social and economic impacts of decisions. 7 Employ valid and reliable research strategies 8 Utilize critical thinking to make sense of problems and persevere in solving them 11 Use technology to enhance productivity 12 Work productively in teams while using cultural/global competence Capacities of Literate Individuals CCSS for ELA & Literacy 1 They demonstrate independence. 3 They respond to the varying demands of audience, task, purpose, and discipline. 4 They comprehend as well as critique. 5 They value evidence 6 They build strong content knowledge. Standards for Mathematical Practice CCSS for Mathematics 1 Make sense of problems and persevere in solving them. 2 Reason abstractly and quantitatively 3 Construct viable arguments and critique the reasoning of others 4 Model with mathematics 5 Use appropriate tools strategically. 7 Look for and make use of structure. 8 Look for and express regularity in repeated reasoning. Scientific and Engineering Practices Next Generation Science Standards 1 Asking questions (for science) and defining problems (for engineering) 2 Developing and using models 3 Planning and carrying out investigations 4 Analyzing and interpreting data 5 Using mathematics and computational thinking 6 Constructing explanations (for science) and designing solutions (for engineering) 7 Engaging in argument from evidence
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		8 Obtaining, evaluating, and communicating information Inquiry Arc of the C3 Framework College, Career, and Civic Life (C3) 1 Developing Questions and Planning Investigations 3 Gathering, Evaluation and Using Evidence 4 Communicating Conclusions and Taking Informed Action Salient 5 3 Verbal Discourse 4 Questioning 5 Technological Expression and Delivery
Student Product, Process or Action	Describe the product, process or action for students to summarize or answer the real world question.	Students will conduct research, brainstorm ideas and create a technical drawing of their proposed dragster design. Students will create a foam model of a Co2 dragster and then test aerodynamics in the wind tunnel. The winning design will be 3D printed. Students will create a 3D model of their Co2 dragster using google SketchUp. Students will create a working prototype of their Co2 dragster out of balsa wood. This will need to be painted with an eye catching design. Students will compile a video presentation to the UDRA with data and an evaluation of their dragsters performance.
Authentic Audience	Explain how the unit will incorporate an authentic audience.	For this unit we will be creating the Urbana Drag Racing Association (UDRA) which is run by our vice principal (Roger). The UDRA is looking for a junior engineer to design and build the next “big thing” in the drag racing field. Students will need to submit their aerodynamic wind tunnel results to the UDRA to determine who will 3D print a model. Finally the students will compile a video with all of the results from this project and submit this to the UDRA to see who had the best new dragster design.
Assessment	Include a list of formative and summative assessments that will be used (ex. quiz, journals, concept maps, peer evaluations, presentations)	Warm Ups Technical Drawings Foam Model Wind Tunnel Data 3D SketchUp Model Balsa Wood Model Final product - video presentation with data and evaluation Engineering Notebook (Must do a file make a copy with this form and make one for yourself)

Entry Event	Describe an engaging activity, event or creative method to introduce students to the unit.	Create VIDEO from UDRA Rep (Roger) SCRIPT The UDRA is looking for junior engineers to design a new dragster for their championship race. They are looking for fresh new talent to come up with the most aerodynamic dragster to date. These dragsters are going to be powered by a Co2 cartridge located at the rear of the vehicle. You will complete your research and create a styrofoam prototype of your dragster design. Next you must test your aerodynamics in the wind tunnel and analyze your design. You will create a presentation with your results and submit them to the UDRA. The UDRA will choose the most aerodynamic dragster to 3D print as a prototype. Finally you will make any necessary changes to your design and create a balsa wood model to drag race against your class competitors.											
Need to Know List	Generate a list of knowledge and skill questions students will need to know to answer the driving question. (This list will be developed by students in class but a teacher developed list in advance will help plan the unit)	<table><tr><th>Need to Know List</th><th>Lesson Seeds</th></tr><tr><td>What are aerodynamics and how are they applied to race cars?</td><td>Research & padlet</td></tr><tr><td>How do we safely construct our projects?</td><td>Safety lectures and quizzes</td></tr><tr><td>Research Techniques</td><td>Website Evaluation/Reliability Collaboration Consensus Building Supported Conclusions</td></tr><tr><td>Use of tools and equipment</td><td>Modeling</td></tr></table>		Need to Know List	Lesson Seeds	What are aerodynamics and how are they applied to race cars?	Research & padlet	How do we safely construct our projects?	Safety lectures and quizzes	Research Techniques	Website Evaluation/Reliability Collaboration Consensus Building Supported Conclusions	Use of tools and equipment	Modeling
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Career Connections	Describe STEM careers that relate to the content or real world connection. Allow students to research career connections related to the real world problem.	Research the field of car design and aerodynamics
Resources Needed	These are links to community resources, media, lesson plans, outside resources, related background information, and other instructional materials for teachers and students.	UDRA Video Prompts Lesson Plans Warm Ups Design Brief Co2 Dragster Presentation Co2 Dragster Packet Final Body Template Rubric Kahoot
Reflection Methods	Include a list of individual, group, and/or whole class reflection methods (ex. journals, survey, fishbowl discussion)	Engineering Notebook (DO NOT EDIT THIS, IMMEDIATELY OPEN AND MAKE A COPY FOR YOURSELF) Video