

Subject: Technology Education

Unit: CO2 Car Unit

Part I: Clarity of Learning Targets

What are the grade level indicators that go with this unit? Place a star next to the grade level indicators that are Power Indicators. Are the indicators in student friendly language? Place the level of Bloom's Taxonomy next to each Power Indicator.

- **Understand** the concepts of scaled drawings
- Students will **research** car designs
- Students will **understand** why design, craftsmanship and functionality are important.
- Students will **evaluate** a car in order to determine the components of quality (design, functionality & craftsmanship)
- Students will **understand** the safety and operating procedures for construction equipment using to construct the car
- Students will **use** construction equipment in order to **create** and shape the car
 - Students will cut wood using a scroll saw
 - Students will drill holes using a drill press
 - Students will use wood glue
 - Students will sand wood using a belt & disc sander
 - Students will use a file to shape the car
 - Students will use hand sandpaper of different grades in order to prepare the car for painting
 - Students will learn to effectively apply paint

What are the Big Ideas that go with this unit?

1. The purpose of design is to create something that works (functionality) and looks nice (aesthetically pleasing).
2. Craftsmanship relates to paying attention to detail during the construction of a product. Craftsmanship affects how a car looks and how well it functions.
3. Effort is putting in the right amount of time needed on a project in order to do things the right way the first time.
4. Functionality is a product doing what it was designed to do. Functionality is important because it affects the product's performance.

What are the Essential Questions that go with this unit?

1. What are the components of design (functionality & aesthetics) and why are they important to keep in mind as you are making a product?
2. What is craftsmanship, what is its purpose and how does it affect the design of a car?
3. What is effort and how does it impact the overall quality of the car?
4. What is functionality and why is it important?

What strategies will we use in order to make learning targets clearer for all students, before, during and after instruction? How will you communicate the learning indicators to students?

- Teacher will provide Big Ideas and Essential Questions to students after initial demonstration of CO2 cars
- Teacher will refer to the learning targets, Big Ideas and Essential Questions throughout the unit
- Teacher will use rubrics and class discussions in order to help students identify what craftsmanship, quality design and good functionality look like.
- Students will self and peer assess work and reference learning targets when doing so.
- Students will have unit instructions available on the common student folder for OFMS

Part II: Feedback and Assessments (Formative and Summative)

How will we provide students with feedback throughout the unit?

What formative assessments will we use? (Non-graded assignments that check for understanding and provide feedback to the students) Incorporate the 7 Strategies of Assessment for Learning here.

Formative Assessment 1

- Students will take a safety test for all 3 pieces of construction equipment in order to be able to use the equipment necessary for the unit project

Formative Assessment 2

- Begin unit with showing 2 completed cars race followed by students working in small groups to document what they saw.
 - What did you notice about Car A?
 - What did you notice about Car B?
 - What did it look like?
 - How did it perform?
 - Why do you think the cars performed as they did?
- Teacher guides student report outs—Groups of students report out common things they saw...teacher records these with class
 - Teacher categorizes the students' observations—relates student observations to project rubric

Formative Assessment Continued...

Teacher shares strong and weak examples of the project throughout the unit with students

- Teacher will share examples of strong and weak work throughout the unit in order to prepare students to self-assess and peer assess their work (e.g. make a car with very poor cuts and very good cuts and ask students to describe which one is better; make a car's axle holes properly and improperly and ask students to rate the quality)...next...
- After students have direct instruction relating to quality components and are able to identify them, students periodically check their car and have peers check
 - A formative checklist needs to be designed to structure the self and peer assessment of the project that will, for instance, have students do self checks of quality to determine whether or not their car is meeting quality components; have students trade cars in order to get feedback on quality components (i.e. the rubric). For example—create a series of self and peer “spot checks” to compare car design to rubric. Students would self-assess and rate their work compared to a rubric and then they would peer assess and do the same thing. This could happen throughout

How will students be involved with keeping track of their own learning progress (note—this is different than tracking points for a grade)?

- Student has a self-check sheet to record self and peer feedback that will help them know if they are on track to complete the project and to complete it with good functionality, craftsmanship and design.

What summative assessments will we use? (Graded, evaluative assessments)

- Teacher will grade the project before the race using the rubric
- Students will race their cars at the end of the unit

Olmsted Falls Schools: Unit Design Framework
Part III: Instruction and Student Activities

What instructional and student activities will we use for this unit? These activities should directly align with the indicators and assessments.

Introduction of Project & Concepts

- 2 cars are raced at the onset in order to demonstrate how CO2 cars work
- Opening instructional activity that will allow students to talk about how 2 cars performed and why they performed the way they did
- Good versus bad design
- What makes a car go fast?
- Discussion of car design followed by students research design of cars

Safety and Operation of Equipment

- Students will receive instruction on safety rules
- Students will receive instruction on the operation of the construction equipment
- Take and pass safety test

Creation

- Students create a small sketch of cars
- Requirements of transferring a sketch to a half size drawing in order to check for accuracy; once accuracy has been obtained, students transfer the drawing to a full-scale sheet of paper
- Begin car building

Student & Peer Formative Checkpoints for CO₂ Car

	Big Idea	Criteria for success	Formative Assessment			What's next?
			Self	Peer1	Peer2	
Check point #1	Initial Design	<p><u>The Sketch</u></p> <p><u>Exemplary (3)</u>—very creative sketch; intricate cutting needed for final product; very detailed</p> <p><u>Proficient (2)</u>—Put forth effort in design; cutting needed for final product; average detail</p> <p><u>Developing (1)</u>--Not very creative (very little cutting involved, will entail very little work); little effort put into the design; not much detail;</p>				<p><input type="checkbox"/> If my car is a 3 or 2, I'm ok to move on</p> <p><input type="checkbox"/> If my car is #1, I need to revise my sketch</p>
Check point #2	Final Design	<p><u>The Final Design</u></p> <p><u>Exemplary (3)</u>—there is no criteria for this category.</p> <p><u>Proficient (2)</u>—correct size and has been correctly transferred to full size.</p> <p><u>Developing (1)</u>—size is off (too short or too thin); and/or incorrectly transferred to final paper</p>				<p><input type="checkbox"/> If my car is a 3 or 2, I'm ok to glue this design to the block of wood.</p> <p><input type="checkbox"/> If my car is a 1, I need to revise my design in order to glue</p>

Student & Peer Formative Checkpoints for CO₂ Car

	Big Idea	Criteria for success	Formative Assessment			What's next?
			Self	Peer1	Peer2	
Check point #3	<p>Craftsmanship</p> <ul style="list-style-type: none"> • Cut out design and drill front axle holes. 	<p><u>Exemplary (3)</u>—all cuts clearly follow the pattern (thickness, length); the correct axle hole has been drilled (front); front axle hole drilled in precise location; axle hole is exactly according to directions.</p> <p><u>Proficient (2)</u>—cuts mostly align to pattern with some variation; front axle hole has been drilled; axle hole location is close to perfection; axle hole is the correct size.</p> <p><u>Developing (1)</u>—cuts vary from pattern in many locations; wrong axle hole drilled (back instead of front); axle hole is in the wrong location; axle hole is too large.</p>				<ul style="list-style-type: none"> <input type="checkbox"/> If my car is a 3 or 2, I'm ok to move on to sanding and painting <input type="checkbox"/> If my car is a 1 (does not meet craftsmanship standards), I need to fix it.

Student & Peer Formative Checkpoints for CO₂ Car

	Big Idea	Criteria for success	Formative Assessment			What's next?
			Self	Peer1	Peer2	
Check point #4	Craftsmanship, Painting & Effort	<p>Sanding</p> <p><u>Exemplary (3)</u>—smoothly sanded with no rough spots; no gaps or uneven areas after gluing; looks like 1 piece of wood</p> <p><u>Proficient (2)</u>—mostly smooth; very little gapping and mostly even areas; almost looks like 1 piece of wood</p> <p><u>Developing (1)</u>—not smooth; gaps are evident as are uneven areas; clearly looks like more than 1 piece of wood</p> <p>Painting</p> <p><u>Exemplary (3)</u>—smooth, shiny, even coat of paint; painting is very neat (e.g. no finger prints, dirt, etc.), professional</p> <p><u>Proficient (2)</u>—coat of paint is mostly smooth and even; few signs of blemishes</p> <p><u>Developing (1)</u>—paint</p>				<p><input type="checkbox"/> If my car is a 3 or 2, I'm ok to move on to adding wheels and axles</p> <p><input type="checkbox"/> If my car is a 1, I need to re-sand or re-paint parts of my car</p>

Student & Peer Formative Checkpoints for CO₂ Car

	Big Idea	Criteria for success	Formative Assessment			What's next?
			Self	Peer1	Peer2	
		drips; can still see the wood; painting isn't neat (e.g. you can see finger prints, dirt, and so on)				
Check point #5	Functionality	<p>The Car Works</p> <p><u>Proficient (2)</u>—wheels function efficiently (spin; don't wobble; axle is correct length); screw eye is in the correct location (e.g. doesn't touch the ground)</p> <p><u>Developing (1)</u>—wheels don't function properly (e.g. wobble, rub against the car, don't spin); screw eye is in the wrong location;</p>				<input type="checkbox"/> If my car is a 2, I'm ready to race. <input type="checkbox"/> If my car is a 1, I need make some changes.