Grade 9 Design
Units of Study

UNIT 1:	Advocate (Students create symbols to advocate for a cause)	Start: August	Duration: 1 Weeks/28 Hours

- **Concepts:** Communication and Perspectives
- **Subject Specific Skills**: Digital design, laser cutting, CNC routing, pewter casting, and resin casting.
- **Learning Experiences**:
    - Students digitally design a symbol, cut the design in Medium Density Fiberboard (MDF) or
    - Cast a pewter piece by pouring molten pewter into the MDF mold
    - Resin cast on pewter piece to add color

UNIT 2:	Control Freak (Students build an Arduino controlled input/output device)	Start: January	Duration: 12 Weeks/28 Hours

- **Concepts:** Systems and Invention
- **Subject Specific Skills**: Coding, electronics, circuitry and construction of housing.
- **Learning Experiences**:
    - Students design a device with an input and output using an Arduino
    - Students code their device to perform specific functions
    - Students construct housings for their devices

UNIT 3:	Pinewood Derby (Students build a wooden race car)	Start: April	Duration: 9 Weeks/20 hours

- **Concepts:** Form and Function
- **Subject Specific Skills**: Woodworking skills
- **Learning Experiences**:
    - Students design a pinewood derby car
    - Students test their cars.

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Grade 9 Design
Unit 1: Advocate

Start: August

Duration: 12 Weeks (28 Hours)

LEARNING EXPERIENCES: Students pick a cause about which to raise awareness and digitally create a symbol for this cause. They cut the design in either wood or MDF to create a pewter mold. The symbols are cast in pewter and colored with resin.

KEY CONCEPT: Communication	Related Concepts: Perspectives

STATEMENT OF INQUIRY:	Designs can advocate for a cause.

INQUIRY QUESTIONS:	
Factual:	What is fairness?
Conceptual:	How can a product advocate for fairness?
Debatable:	Does fairness have the same meaning across the world?

OBJECTIVES AND ASSESSMENT CRITERIA:		
A:	**Inquiring & Analyzing**	i. explain and justify the need for a solution to a problem for a specified client/target audience ii. identify and prioritize the primary and secondary research needed to develop a solution to the problem iii. analyse a range of existing products that inspire a solution to the problem iv. develop a detailed design brief, which summarizes the analysis of relevant research
B:	**Developing Ideas**	i. develop a design specification, which clearly states the success criteria for the design of a solution ii. develop a range of feasible design ideas, which can be correctly interpreted by others iii. present the chosen design and justify its selection iv. develop accurate and detailed planning drawings/diagrams and outline the requirements for the creation of the chosen solution.
C:	**Creating the Solution**	i. construct a logical plan, which describes the efficient use of time and resources, sufficient for peers to be able to follow to create the solution ii. demonstrate excellent technical skills when making the solution iii. follow the plan to create the solution, which functions as intended iv. fully justify changes made to the chosen design and plan when making the solution
D:	**Evaluating**	i. design detailed and relevant testing methods, which generate data, to measure the success of the solution ii. critically evaluate the success of the solution against the design specification iii. explain how the solution could be improved iv. explain the impact of the solution on the client/target audience.

ATLs:	Communication, Social, Self-management, Research & Thinking

RESOURCES:

- Illustrator, Inkscape, sketch.io, Laser cutter or CNC Router, MDF, Wood, Pewter and Resin

SUMMATIVE ASSESSMENT TASKS:

1. Criterion A: Students explore the process of pewter and resin casting. They explore sketching, digital design software, pewter casting and resin casting. Students also analyze existing products.
2. Criterion B: Students develop design specification and design ideas for their symbols.
3. Criterion C: Students document the process of creating their pewter cast symbols.
4. Criterion D: Students evaluate the success of their symbols in multiple ways.

Grade 9 Design

Unit 2: Control Freak

Start: January   **Duration:** 12 Weeks (28 Hours)

LEARNING EXPERIENCES: Students design a control system using codable Arduinos as well as input and output electronic components. Students then house the system in a purpose built housing.

KEY CONCEPT: Systems	Related Concepts: Invention

STATEMENT OF INQUIRY:	Control systems can be used to invent and innovate.

INQUIRY QUESTIONS:	
Factual:	What is a System? What is Digital? What Analog? What is a microcontroller?
Conceptual:	How can we improve systems?
Debatable:	Do all systems improve the quality of our lives?

OBJECTIVES & ASSESSMENT CRITERIA:	
A: Inquiring & Analyzing	i. explain and justify the need for a solution to a problem for a specified client/target audience ii. identify and prioritize the primary and secondary research needed to develop a solution to the problem iii. analyse a range of existing products that inspire a solution to the problem iv. develop a detailed design brief, which summarizes the analysis of relevant research
B: Developing Ideas	i. develop a design specification, which clearly states the success criteria for the design of a solution ii. develop a range of feasible design ideas, which can be correctly interpreted by others iii. present the chosen design and justify its selection iv. develop accurate and detailed planning drawings/diagrams and outline the requirements for the creation of the chosen solution.
C: Creating the Solution	i. construct a logical plan, which describes the efficient use of time and resources, sufficient for peers to be able to follow to create the solution ii. demonstrate excellent technical skills when making the solution iii. follow the plan to create the solution, which functions as intended iv. fully justify changes made to the chosen design and plan when making the solution
D: Evaluating	i. design detailed and relevant testing methods, which generate data, to measure the success of the solution ii. critically evaluate the success of the solution against the design specification iii. explain how the solution could be improved iv. explain the impact of the solution on the client/target audience.

ATLs:	Communication, Self-management, Research & Thinking

RESOURCES:
- Arduino, Electronic Components, Illustrator, Laser cutter, 3D Printing, Wood, Acrylic and Paint

SUMMATIVE ASSESSMENT TASKS:
1. Criterion A: Students explore the process of coding an Arduino. They explore coding, sketching, digital design software, manufacture, assembly and finishing techniques. Students also analyze existing products.
2. Criterion B: Students develop design specification and design ideas for their control systems and housing .
3. Criterion C: Students document the process of creating their control systems.
4. Criterion D: Students evaluate the success of their control systems in multiple ways.

Grade 9 Design
Unit 3: Pinewood Derby

Start: April

Duration: 9 Weeks (20 Hours)

LEARNING EXPERIENCES: Students design and build a pinewood derby car out of a block of wood and race the cars to evaluate their effectiveness.

KEY CONCEPT:	Related Concepts: Form and Function

STATEMENT OF INQUIRY:	The form of a product has an effect on the function.

INQUIRY QUESTIONS:	
Factual:	What techniques do we use to shape wood? What finishing techniques can I use?
Conceptual:	What affects a car's motion?
Debatable:	Are aerodynamics affected by finishing techniques?

OBJECTIVES AND ASSESSMENT CRITERIA:	For each criterion below summarize **ALL** the assessment strands into 2-3 sentences.
D: Evaluation	i. design detailed and relevant testing methods, which generate data, to measure the success of the solution ii. critically evaluate the success of the solution against the design specification iii. explain how the solution could be improved iv. explain the impact of the solution on the client/target audience.

ATLs:	Thinking

RESOURCES:
- Wood/Wood-working machines (drill press, sander, scroll saws)
- FInishing techniques

SUMMATIVE ASSESSMENT TASKS:
1. Criterion D: Students evaluate the success of their control systems in multiple ways.