Grade 6 Design

Units of Study

UNIT 1:	**Robotics** **(Students design SumoBots to fight it out in the Pentagon)**	**Start:** August	**Duration:** 2 weeks/ 5 Hours

- **Concepts:** Systems, Evaluation, and Function
- **Subject Specific Skills**: Coding and Evaluating
- **Learning Experiences**:
  - Following written directions for building a robot
  - Coding
  - Evaluation of products

UNIT 2:	**"Toys for Refugees"** **(Students design and print toys using 3D printers)**	**Start:** September	**Duration:** 14 weeks/ 33 Hours

- **Concepts:** Connections and Form
- **Subject Specific Skills**: Digitally aided design, 3D printing and finishing techniques.
- **Learning Experiences**:
  - Sketching skills
  - 3D modeling
  - Using 3D printers
  - Coloring and painting

UNIT 3:	**"Makey Makey"** **(Students design, code and build interactive toys)**	**Start:** January	**Duration:** 16 Weeks / 37 Hours

- **Concepts:** Creativity and Adaptation
- **Subject Specific Skills**: Coding, electronics, laser cutting, assembly techniques and finishing techniques
- **Learning Experiences**:
  - Coding with Scratch
  - Circuitry with Makey Makey
  - Digital designing for laser cutting
  - Assembly techniques involving gluing
  - Finishing techniques with taping, stitching, painting and markers

UNIT 4:	**Joinery** **(Student build a wooden frame)**	**Start: March**	**Duration:** 3 Weeks/ 7Hours

- **Concepts:** Systems, Form
- **Subject Specific Skills**: Laser cutting, woodworking, joinery, assembly techniques and finishing techniques
- **Learning Experiences**:
  - Different joints
  - Digital design for laser cutting
  - Adhesive and mechanical joinery
  - Assembly techniques for mixed materials
  - Finishing techniques with paint, markers

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Unit 1: Robotics

Start: August **Duration:** 5 Weeks (11 Hours)

LEARNING EXPERIENCES: Students build Lego Mindstorm robots and learn to code the robots to complete a series of challenges. Students then code their robots to 'wrestle' another robot in a pentagonal shaped Sumo ring. The goal of the match is to push the other robot out of the ring.

KEY CONCEPT: Systems	**Related Concepts:** Function and Evaluation

STATEMENT OF INQUIRY:	A system can be formed of different parts working together to perform a specific function.

INQUIRY QUESTIONS:	
Factual:	What is a robot?
Conceptual:	How do we ensure that robots do what we want them to do?
Debatable:	Are robots good for society or bad for society?

OBJECTIVES AND ASSESSMENT CRITERIA:	Summary of Assessment
D: Evaluating	i. outline simple, relevant testing methods, which generate data, to measure the success of the solution ii. outline the success of the solution against the design specification iii. outline how the solution could be improved iv. outline the impact of the solution on the client/target audience.

ATLs:	Social

RESOURCES:

- Lego Mindstorm EV3 robots
- Google forms
- Decibel meter

SUMMATIVE ASSESSMENT TASKS:

1. Criterion D: Students evaluate the success of their robots in multiple ways. They also assess the impact of their robots on school spirit at an MYP assembly.

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Unit 2: Toys for Refugees

Start: October **Duration:** 10 Weeks (23 Hours)

LEARNING EXPERIENCES: We leverage the idea that technology allows us to design products which can be shared across space and time. Using Tinkercad, students design a toy and learn that they could share their designs with anyone who has a 3D printer.

KEY CONCEPT: Connections	**Related Concept:** Form

STATEMENT OF INQUIRY:	Digital designers connect across space and time in order to meet needs.

INQUIRY QUESTIONS:	
Factual:	What is CAD?
Conceptual:	How does CAD help designers?
Debatable:	Is CAD better than traditional drawing methods such as pen and paper?

OBJECTIVES AND ASSESSMENT CRITERIA:	For each criterion below summarize **ALL** the assessment strands into 2-3 sentences.
A: Inquiring and analysing	i. explain and justify the need for a solution to a problem ii. state and prioritize the main points of research needed to develop a solution to the problem iii. describe the main features of an existing product that inspires a solution to the problem iv. present the main findings of relevant research
B: Developing ideas	i. develop a list of success criteria for the solution ii. present feasible design ideas, which can be correctly interpreted by others iii. present the chosen design iv. create a planning drawing, which outlines the main details for making the chosen solution.
C: Creating the solution	i. outline a plan, which considers the use of resources and time, 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. list the changes made to the chosen design and plan when making the solution.

ATLs:	Research and self-management

RESOURCES:

- Tinkercad
- Fusion 360
- Makerbot 3D printers/Filament
- Markers and Paints

SUMMATIVE ASSESSMENT TASKS:

1. Criterion A: Students explore the problems that refugee children face as well at the developmental importance of toys. They then explore 3D modeling software and use of the 3D printers. Students also analyze existing products.
2. Criterion B: Students develop design specification and design ideas for their toys.
3. Criterion C: Students document the design, manufacture, assembly and finishing of their 3D printed toys.

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Unit 3: Makey Makey

Start: January **Duration:** 11 Weeks (24 Hours)

LEARNING EXPERIENCES: Students use the Makey Makey product in conjunction with MIT's Scratch to create a game that can be played by lower elementary students. Students learn how to code in Scratch, assemble electronic components in circuits, laser cut components, gluing techniques and finishing techniques using paint and markers.

KEY CONCEPT: Creativity	**Related Concepts:** Adaptation

STATEMENT OF INQUIRY:	Materials can be creatively combined with electronic components to make interactive designs.

INQUIRY QUESTIONS:	
Factual:	What information do we have to consider when programming a product?
Conceptual:	How can materials combine with programming to make a new product?
Debatable:	Does electronic music sound better or worse than actual instruments?

OBJECTIVES AND ASSESSMENT CRITERIA:	For each criterion below summarize **ALL** the assessment strands into 2-3 sentences.
B: Developing ideas	i. develop a list of success criteria for the solution ii. present feasible design ideas, which can be correctly interpreted by others iii. present the chosen design iv. create a planning diagram, which outlines the main details for making the chosen solution.
C: Creating the solution	i. outline a plan, which considers the use of resources and time, 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. list the changes made to the chosen design and plan when making the solution.
D: Evaluating	i. outline relevant testing methods, which generate data, to measure the success of the solution ii. outline the success of the solution against the design specification iii. outline how the solution could be improved iv. outline the impact of the solution on the client/target audience.

ATLs:	Communication

RESOURCES / LITERATURE OPTIONS:

- Makey Makey
- Various building materials
- Scratch coding software.

SUMMATIVE ASSESSMENT TASKS:

1. Criterion B: Students develop design specification and design ideas for their Makey Makey toys.
2. Criterion C: Students document the design, manufacture, assembly and finishing of their Makey Makey toys.
3. Criterion D: Students evaluate the success of their Makey Makey toys in multiple ways, including the impact on their target audience.

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Unit 4: Joinery

Start: March **Duration: 10** Weeks (23 Hours)

LEARNING EXPERIENCES: Students learn different techniques for joining material using adhesives and mechanical means. They will also explore different types of joints from flat joints to finger joints to miter cut joints.

KEY CONCEPT: Systems	**Related Concepts:** Form
STATEMENT OF INQUIRY:	The final form of a design must take into account the methods by which parts are joined into a system.
INQUIRY QUESTIONS:	
Factual:	What is a system? What is a joint? What is an adhesive?
Conceptual:	How do systems impact our lives?
Debatable:	Does a product require a system to make it functional?
OBJECTIVES AND ASSESSMENT CRITERIA:	For each criterion below summarize **ALL** the assessment strands into 2-3 sentences.
A: Inquiring and analysing	i. explain and justify the need for a solution to a problem ii. state and prioritize the main points of research needed to develop a solution to the problem iii. describe the main features of an existing product that inspires a solution to the problem iv. present the main findings of relevant research
ATLs:	Thinking and Communication

RESOURCES / LITERATURE OPTIONS:

- Makercase.com
- Various materials
- Paints and markers
- Laser Cutter
- Woodworking equipment

SUMMATIVE ASSESSMENT TASKS:

1. Criterion A: Students explore the different methods of joining material while they make a wooden frame.