

## SWALLOW SCHOOL DISTRICT CURRICULUM GUIDE

**Curriculum Area:** Engineering

**Course Title:** Design and Modeling; Trimester

**Grade:** 6<sup>th</sup>

**Date Last Approved:** April 2015; Reviewed: August 2021

### Stage 1: Desired Results

**Course Description and Purpose:**

This course introduces and explores the design process to solve problems and understand the influence of creativity and innovation in their lives. This course is “activity oriented” to further develop student knowledge of engineering and the design process to solve everyday problems. Students use industry standard 3D modeling software to create virtual images of their designs. This course will prepare students for future high school engineering courses.

**Enduring Understanding(s):**

1. Develop an understanding of engineering design.
2. Develop the abilities to apply the design process.
3. Develop an understanding of the attributes of design.
4. Develop the abilities to use and maintain technological products and systems.
5. Develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

**Essential Question(s):**

1. What skills prepare you for diverse career opportunities?
2. How can failure produce positive outcomes?
3. What does it take to effectively develop a solution to a problem or need?
4. What does effective teamwork look like?
5. What is the purpose of modeling?
6. Why are teams of people more successful than an individual when solving problems?
7. How do you express yourself and your creativity through engineering?

**Learning Targets:**

1. Students can apply the design process to create design solutions to solve a problem.
2. Students can apply the design process to analyze solutions using data and communicate their findings.

### Stage 2: Learning Plan

**I. Foot Orthosis Instant Design Challenge**

- A. Design Process
1. Define a problem
  2. Generate concepts
  3. Design a solution
  4. Build and test solution
  5. Evaluate solution
  6. Present solution

**Standards Referenced:** NGSS.MS-ETS1-1, NGSS.P1, NGSS.P2, NGSS.P5, NGSS.P6, NGSS.P7, NGSS.P8

**Learning Targets Addressed:** 1 & 2

**Key Unit Resources:** MyPLTW, Teacher Created Resources

**Assessment Map:**

Type	Level	Assessment Detail
Practice	Knowledge	In class activities
Formative	Skills/ Reasoning	Written response
Summative	Product	Foot Orthosis Prototype

<b>II. Skimmer Challenge</b>  A. Sketching B. Measurement C. Using a ruler D. Dimensioning E. Skimmer Construction F. Skimmer Statistics	<b>Standards:</b> NGSS.P1, NGSS.P5, NGSS.P6, NGSS.P8											
	<b>Learning Targets Addressed:</b> 1 & 2											
	<b>Key Unit Resources:</b> MyPLTW, Teacher Created Resources											
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Summative	Product	Constructed Skimmer										

<b>III. Puzzle Cube Design Challenge</b>  A. Solid Modeling <ol style="list-style-type: none"> <li>3D modeling software</li> <li>Creating and manipulating 3D objects</li> <li>Combining 3D objects</li> <li>Sizing and dimensioning</li> <li>Building puzzle cubes</li> </ol>	<b>Standards:</b> NGSS.MS-ETS1-2, NGSS.P1, NGSS.P2, NGSS.P6, NGSS.P7, NGSS.P8											
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Summative	Product	Wooden Puzzle Cube										

#### IV. Therapeutic Toy Design

- A. Design Process
  - 1. Define a problem
    - a. Research / Design Brief
  - 2. Generate concepts
    - a. individual designs
    - b. Decision matrix
  - 3. Design a solution
    - a. Development of solution
    - b. Sketches of solution
  - 4. Build and test solution
    - a. Creation of 3D model
    - b. Creation of prototype
  - 5. Evaluate solution
  - 6. Present solution

**Standards:** NGSS.MS-ETS1-2, NGSS.P1, NGSS.P2, NGSS.P6, NGSS.P7, NGSS.P8

**Learning Targets Addressed:** 1 & 2

**Key Unit Resources:** MyPLTW, Teacher Created Resources

**Assessment Map:**

Type	Level	Assessment Detail
Practice	Knowledge	In class activities
Formative	Skills/ Reasoning	Written response, 3D modeling on Tinkercad
Summative	Product	Therapeutic Toy prototype, 3D printed Therapeutic Toy prototype